The

Electrical Review

VOL. XCIX. OCTOBER 15, 1926. No. 2,551.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT., LONDON." Code, A B C. Telephone No.: Central 7072 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
Electricity Supply	605
An Appeal for Generosity	606
Japan's Post-Earthquake Electrical Trade	606
A Misleading Circular	606
William Henry Eccles, President I.E.E. (*illus.*)	607
The Structural Design of Overhead Lines, by Wm. E. Poole (*illus.*) (*concluded*)	608
Pivot Friction, by F. L. Best (*illus.*)	610
Railway Electrification (*illus.*)	612
The Industrial Situation in Germany	614
The Electric Drive in Coal Washing, by J. C. Knowles	615
The First National Radio Exhibition—V (*illus.*)	616
The Combustion of Low-grade Coal, by J. N. Waite	618
Business Notes	619
Lighting and Power Notes	623
Tramway and Railway Notes	625
Telegraph and Telephone Notes	625
Radio Notes	626
Contracts Open and Closed	626
Forthcoming Events	627
Notes	627
Institution Notes	629
Our Personal Column	629
New Companies Registered	630
Official Returns of Electrical Companies	631
City Notes	631
Stocks and Shares	632
Electrical Imports and Exports of Japan	633
Kiosk-type Sub-stations (*illus.*)	634
A Kaplan Turbine Installation (*illus.*)	634
Research in Ventilation	635
The "Seeleo" Wiring System (*illus.*)	636
Notes from Canada	636
The Birmingham and Midlands Wireless Exhibition	637
Electrical Features of Manchester Civic Week (*illus.*)	638
New Electrical Devices, Fittings, and Plant (*illus.*)	639
Correspondence—	
The Lightning Rod Act in Ontario, Canada	640
Relief Bolts and Flameproof Enclosures	641
The Remuneration of Electrical Engineers	641
Electrical Refrigeration Classes	641
The London Electricity Supply Companies	641
Application Binding Fees	641
The Tungstone Accumulator	642
A National Wireless Week	642
Legal	642
Reviews	642
Trade-Mark Applications	644
Published Specifications	644
Contractors' Column	Advertisement page xxxiv

Electricity Supply.

NOW that the holiday season has come to a close, the time approaches when the attention of the electrical world will once more be concentrated on the progress of the Electricity (Supply) Bill through Parliament. The scope for amendment of the Bill in the House of Commons is restricted to the debate on the Report of Standing Committee C; it does not appear, up to the present, that drastic changes in its terms will be effected in the House of Lords, and therefore it seems probable that the Bill will become law without material alteration, although the most important bodies in the British electrical industry have declared that its provisions are based on false premises and are likely to have highly detrimental results.

We have already pointed out numerous grounds for opposition to the Bill, including the use of erroneous and misleading statistics and the lack of important data. As regards the latter, we observed with interest in the summer that the Electricity Commissioners were issuing to electricity suppliers a demand for the continuous load curves of their generating stations for a week in June and a week in December, and a return of daily maximum loads on the generators for 18 days in December, 1925, with the time of their occurrence and their duration. The purpose of these inquiries is obviously to ascertain whether any advantage is to be gained by linking-up power stations, by the operation of diversity factor. Seeing that we have already been assured that the result of that process would be enormous economy in plant and in running costs, the inquiry at this stage would seem to be superfluous; if it were to be made at all, surely it ought to have been made before the Government had committed itself beyond recall to a definite line of policy. Of what use are these data after the event?

Unfortunately the Electricity Commissioners, in common with the Weir Committee and the electrical industry in general, have been suffering from a lack of reliable data all along. We do not yet know, for instance, how much electricity is generated by British industrial concerns for their own purposes, though the Commissioners' last two annual reports have indicated that the amount is very considerable—something like 100 units per head of the whole population per annum, and therefore of the same order of magnitude as the supplies produced by statutory authorities.

At the Conservative Party's Conference at Scarborough, on October 7th, the Prime Minister referred to the Bill, and declared that it did not provide either for nationalisation or for the State supply of electricity to consumers. We are not sure that either statement can be accepted without some qualification. Many millions sterling are to be spent on capital account by a State department created for that purpose, and the interconnecting mains thus set up will remain the permanent property of the department. It will be remembered that the Government similarly erected a system of trunk telephone lines throughout the country, and in the end nationalised the telephone system almost wholly —Hull remaining the sole exception. The precedent thus established is not without significance. Again, the State department aforesaid will supply electricity in bulk to authorised undertakings—either purchasing it, or, if necessary, generating it. Mr. Baldwin further stated that (he hoped) electricity would be supplied to those undertakings at a lower price than could be reached by even the best installation of to-day, through the saving in capital charges and the improved load factor; but whether the Government is going the right way to attain either of these ends is very questionable. No other Government has adopted a policy even remotely resembling that which is now before the country; it is a gigantic and unprecedented experiment, based upon assumptions which, in our opinion, are unwarranted by the facts, and unsupported by reliable estimates.

What South-East Lancashire, which justly claims an exceptionally high efficiency, thinks of the Bill is well shown in our "Notes" to-day. The Advisory Board is doing all it can to secure exemption for its area from the collective operation of the national scheme, being prepared even to give place to a Joint Electricity Authority for that purpose. In other words, it desires in effect to "contract out" of the scheme, and to carry on the development of its electricity supply unhampered by the lower efficiency of other areas, which would tend to maintain its tariff at a higher rate than if it were isolated. Every area where cheap electricity is available will press for similar privileges—none wishes to adopt the altruistic pose. But on this point the Government will not yield.

An Appeal for Generosity.

The Spring of 1914 seems so far back in history that it is not to be wondered at if some of our readers need to be reminded of a signal event that occurred just then in connection with the electrical industry. We refer to the very splendid achievement that marked the chairmanship of the annual dinner of the Electrical Trades Benevolent Institution when a record sum amounting to approximately £3,000 was added to the funds almost entirely as a direct result of the chairman's efforts. The Institution is fortunate in having the same gentleman as its Festival President for 1926, and remembering what the Fund owes to Sir Hugo Hirst for his previous record assistance, one is fully justified in bespeaking for him such a full measure of support from the electrical and allied industries as shall enable him to beat even his own record on this occasion. The Festival has been fixed for November 10th at the Trocadero Restaurant, and Sir Hugo has already enlisted the co-operation of an army of staff members belonging to the extensive company over whose interests he presides, and these, we trust, will find considerable satisfaction in securing practical help from a host of trade and other friends and acquaintances. But beyond all the personal influence that the President and his business staff, as well as the official staff of the E.T.B.I., can exert for this most worthy of objects, it would be very gratifying if employers and staffs of other manufacturing concerns would throw in their ingenuity and energy in swelling the total contributions on this occasion. If they would hand the matter over to the sympathetic and zealous care of heads of departments we believe that the revenue of the Institution would be so substantially added to as to make its resources more nearly equal to the great end for which we have laboured so long—namely, the granting of actual pensions. The electrical industry is a much bigger affair to-day than it was in the spring of 1914; it is in a far more prosperous condition too; and the outlook is brighter than ever, but the resources which it has earmarked for charitable distribution have not grown in anything like the same proportion, and we cannot ignore the fact that the value of money is far less than it was in 1914. The total invested capital of the E.T.B.I. only yields an income of approximately £1,000 a year. However prosperous may be the state of the industry, men who have long been in the battle fall stricken, some temporarily, others permanently, without having had opportunity to provide for evil days. There are lame dogs to help over stiles with temporary assistance—the full story of the excellent service thus rendered would be a very touching one if it could be intelligently told without breach of confidence; but there are others who, like Gwen, will never walk again; for these the back of life is broken, and it is to them that our hearts go out in sympathy as we appeal to everybody to give the 1926 Festival such generous support as shall enable it to bring to any such in their later years that peace and quiet which the enjoyment of a definite pension may do so much to ensure.

Japan's Post-Earthquake Electrical Trade.

After a considerable delay due to the earthquake and fire, the Japanese Government has resumed publication of its annual detailed statistics of foreign trade. It has just issued a volume which includes particulars of imports and exports by countries in 1924, together with such figures as could be given relating to 1922 and 1923. With these two years no useful comparison can be made, as many of the records at Yokohama and elsewhere were destroyed. Considerable interest, however, attaches to the statement regarding the foreign trade in electrical material in 1921 and 1924, which is printed on another page. Both imports and exports show the effects of the great disaster, the former by their large increases under nearly every heading, and the latter by the fact that the decline in oversea sales, which had set in before the earthquake, became very marked. With regard to 1925, for which a few totals are available, it is noteworthy that on the export side the falling-off has been checked, whilst amongst imports there have been increases in telephone instruments and many of the less important items, but decreases in heavy plant.

A Misleading Circular.

Electrical readers of the daily newspapers must have been surprised to learn of a drastic reduction in the wages of men employed in the electrical contracting industry. Some representative headings used were: "Big wage reduction" (*Times* and *Yorkshire Post*); "Reduction of over 26 per cent." (*Daily Telegraph*); and "Cut in wages" (*Daily Dispatch*). The news item consisted of a paragraph, evidently circulated by an agency, stating that "the variation in the cost of living justifies a 26⅔ per cent. reduction in wages in the electrical contracting industry." The news was incorrect, for actually there is no new reduction; but it was not the fault of the agency, for the letter circulated by the National Federated Electrical Association certainly plainly indicated a reduction. We ourseles should have gained the same impression had we not known the existing rates and compared them with the "new" rates and found them identical. The reduction of 26⅔ per cent. is from a basic rate fixed in 1921, and the process has, of course, been gradual.

The Secretary of the N.F.E.A. has since explained the matter to the Press, but we certainly think that the circular, which is sent out once every four months, should be less ambiguous, or, shall we say, less direct in a wrong way.

William Henry Eccles,

President of the Institution of Electrical Engineers.

William Henry Eccles was born in Furness in 1875, and received his early education at a private school and a secondary school in Barrow-in-Furness. Between leaving school and entering college he spent some time in the study of chemistry, and in absorbing information on foundry work, forging, and structural engineering in his father's works. In 1894 he entered the Royal College of Science, and during the five years he spent there he specialised in physics and followed the advanced courses of the mechanical department. He also attended some of the courses in electrical engineering at the City and Guilds Central Technical College.

The new president of the Institution of Electrical Engineers is known to most of its members by his connection with the development of wireless telegraphy. Indeed, he was one of the earliest workers in this branch of electrical engineering, having already in 1899 assisted in the development of Signor Marconi's inventions by the Wireless Telegraph and Signal Co., of Chelmsford. Since that time he has been continuously associated with wireless telegraphy, notwithstanding the calls of his other numerous activities, and it may well be said that any body constituted to work on "wireless" is hardly complete without him.

Claude Harris] [*London.*

W. H. Eccles, D.Sc., F.R.S., M.I.E.E.

His departure from Chelmsford to take up the position of demonstrator in electrical engineering and physics at the South-Western Polytechnic enabled him to give scope to a different branch of his widely spread knowledge, and incidentally, when he became head of the physics department, enabled him to start in the laboratory of the Polytechnic, and in his private laboratory at the bottom of the chimney stack of the L.C.C. pumping station, near Victoria Bridge, a long series of researches in wireless telegraphy which were published between 1905 and 1912 in the *Proceedings* of the Royal Society, the *Journal* of the Institution of Electrical Engineers, the *Proceedings* of the Physical Society, the *Philosophical Magazine*, the *Electrician*, the Electrical Review, and other journals.

Dr. Eccles proved at Chelsea to have a great gift for teaching, which he had further opportunity of showing by becoming, in 1911, University reader in graphic statics, and lecturer in structural engineering at University College, and subsequently, in 1916, he was appointed in succession to the late Prof. Silvanus P. Thompson, to the Chair of Electrical Engineering at Finsbury Technical College, of which, in 1919, he became the Dean.

The wide range of his teaching activities as recorded above is sufficiently remarkable, but to those who have been fortunate in long enjoyment of his intimate personal friendship, it is known that Dr. Eccles possesses an astonishing knowledge of subjects unassociated with physics, electrical engineering, or mathematics. Such a one recalls as quite characteristic the discourse on types of knots and their respective applications, that was provoked by his use in some research work that he was carrying out with Dr. Eccles of the wrong kind of knot in a piece of string. Every detail of such work fell under the close scrutiny of Dr. Eccles, even if it were on the top of a chimney stack and necessitated an internal ascent of the still warm stack.

The experience of Dr. Eccles in teaching mathematics both in its pure and its applied aspect designated him as the man to compose a conflict that became acute at one time in the University of London between the Engineering Boards of Studies and the Board of Studies in Mathematics, by which the papers for engineering students were set. Acting on the conflicting Boards as liaison officer he was able to influence the introduction of a type of mathematical paper more acceptable to the Engineering Boards and suitable for the engineering students.

Dr. Eccles was an active worker during the war for the Board of Invention and Research of the Admiralty, where he experimented on anti-Zeppelin devices, and forms of signalling. He was also appointed honorary Director of an Admiralty staff working in the laboratories of Finsbury Technical College which were lent for the purpose, and in this capacity he supervised experiments on many anti-submarine devices and signalling methods.

Dr. Eccles possesses a brain that works in compartments, which materialise in unassociated heaps of papers that always cover the largest table area at his disposal in his study, so that he can pass from one subject to another with the minimum of trouble. All facts on each subject on which he works are carefully pigeon-holed for future reference, and this habit led to the publication of the "Handbook of Wireless Telegraphy," which, in a sense, may be said to have written itself without any preconceived plan on the part of the author; in fact, it appeared in spite of the author, who is still struggling

against the urgent insistence of new facts claiming to be allowed to appear in the third edition of that work, which is so eagerly awaited by the public.

Dr. Eccles has performed many services for the Institution of Electrical Engineers. In 1919, he helped Mr. Wordingham, then president of the Institution of Electrical Engineers, to form the Wireless Section of the Institution, and became its chairman. He was also elected a member of Council in 1919, and served as a vice-president of the Institution from 1920 to 1924. Meanwhile, he acted as consultant to various wireless telegraph firms, to the Pacific Cable Board, and to other cable companies. In 1920 he became vice-chairman of the Wireless Telegraphy Commission, under Lord Milner as chairman, which advised the Government on Imperial wireless construction, and was later responsible, with the Engineering Department of the Post Office, for the design and erection of the world's largest wireless station at Rugby. He also served on many Government Committees, including the Board of Agriculture's Electro-Culture Committee, the Imperial Wireless Committee of 1919-1920, the Broadcasting Committee of 1923, the Imperial Wireless Committee of 1924, and others in the Army, Navy, and Air Force. Among other activities, he served for several years as hon. secretary to the British Association Committee for radio-telegraphic investigations, and as hon. secretary to the Physical Society. In 1914 he was one of the representatives of the Institution at the International Wireless Conference at Brussels, and he is now president of the Committee on Atmospherics of the International Union of Radio-telegraphic Science. He is a past-president of the Radio Society of Great Britain. In 1921, he was elected a Fellow of the Royal Society.

Many inventions of apparatus for use in wireless telegraphy and electrical engineering laboratories stand to the credit of Dr. Eccles, of which perhaps the most widely known is the method of using a triode valve for sustaining mechanical vibrations, which is the basis of tuning-fork and of quartz-crystal control of the frequency of numerous wireless stations all over the world.

The Institution of Electrical Engineers has chosen for its president a man of great energy, knowledge, and tact, and it is to be expected that the period of his presidency will prove a memorable one.

The Structural Design of Overhead Lines.

The Spacing of Conductors and their Clearances.

By Wm. E. POOLE.

(*Concluded from page* 572.)

Spacing of Conductors.

The spacing of conductors is of considerable importance, both electrically and mechanically; it has a large bearing on the whole of the mechanical design of the line, and affects its electrical characteristics in no small degree. In designing a line the conductor spacing must be fixed at an early stage, as it not only affects the carrying capacity, but also has a definite relation to sag, span and conductor tension. In spite of its importance conductor spacing is often decided in a purely arbitrary manner. Some engineers specify a clearance when one conductor is considered as hanging vertically while the other swings to the full extent calculated from weight and wind forces; others take the even less safe course of assuming that the conductors will swing in synchronism, and provide for a clearance in these circumstances. These methods are open to objection: it by no means follows that swinging conductors having sufficient clearance at the limit of swing will be safe at all points through the angle of swing.

Although, theoretically, conductors, when accurately tensioned, will swing synchronously, one frequently sees them doing otherwise, especially on lines subject to ground subsidences, where tensions, which were accurately adjusted at the time of erection, are upset and pole alignment disturbed.

In fixing the best safe spacing that may be used in connection with any size of conductor strung to a given factor of safety and supported at certain intervals, it is necessary to consider two conductors swinging through the full angle determined by the forces, due to their weight acting vertically, and a wind pressure of 8 lb. per sq. ft. on the full diameter acting horizontally, and alternatively the weight of the conductor loaded with ice and a wind of the same force as before acting on the full diameter of the ice-covered conductor. The angle of swing under the latter conditions is, for the more usual sizes of conductor (.05 to .15 sq. in. copper), some 8 to 10 deg. greater than under the former and may, if desired, be allowed for, but conductors having a safe flashover clearance at all points in the swing under summer, or no ice, conditions will have a large factor of safety against touching, as the British climate is such that although a half-inch covering of ice may be experienced, or an 8 lb. per sq. ft. wind pressure, the chances of the two coming together are hardly greater than the chances of earthquake against which nobody provides. In dealing with the general aspect of the question it has been found advantageous to measure sag and clearance between swinging conductors in terms of spacing. Reference to fig. 15 will show that the sag for any given conductor spacing may be increased, before swinging conductors clash, by tilting the horizontal cross-arm carrying two conductors. The four curves shown are for four angles to which four normal sizes of copper conductor are calculated to swing (approximately) and it will be noticed that the curves steepen in the neighbourhood of 20 to 30 deg. inclination of the cross-arm; in other words, the sag permissible with any given spacing of conductors increases rapidly at angles of inclination of cross-arm above about 20 deg. It will be seen from fig. 16 that when the angle of inclination of cross-arm is equal to the maximum angle of swing of conductors from the vertical, the conductors can never clash, as all points equidistant from the two points of support at the ends of the cross-arm lie on a line at right angles to the cross-arm and bisecting it, and as the line bounding the angle of swing of the lower conductor is parallel to this the conductor can never be on the locus of clashing points. If, however, the ratio of sag to spacing is great the clearance becomes small.

Reverting to fig. 15, the curves in broken and in full line show respectively the relation between the angle of inclination of the cross-arm and the sag at which conductors swinging to certain angles will actually clash, and at which they will clear by one-tenth of the spacing. It is clear from this chart that it is advantageous to place any pair of conductors so that the line joining them is inclined to the horizontal at some angle, preferably over 20 or 30 deg. In a three-phase line the best electrical conditions are obtained by placing the conductors at the corners of an equilateral triangle. If this triangle is set with one side vertical the other two will be inclined at 30 deg. to the horizontal. In any other position one of the sides will be inclined at less than 30 deg., and some advantage will have been lost without any compensating gain.

Consideration must be given to the two conductors in the vertical plane, for although they can never clash by side swing they may in this country be at times unequally loaded and consequently unequally sagged. Reference to a table of sags shows that the maximum difference of sags between two conductors of the same

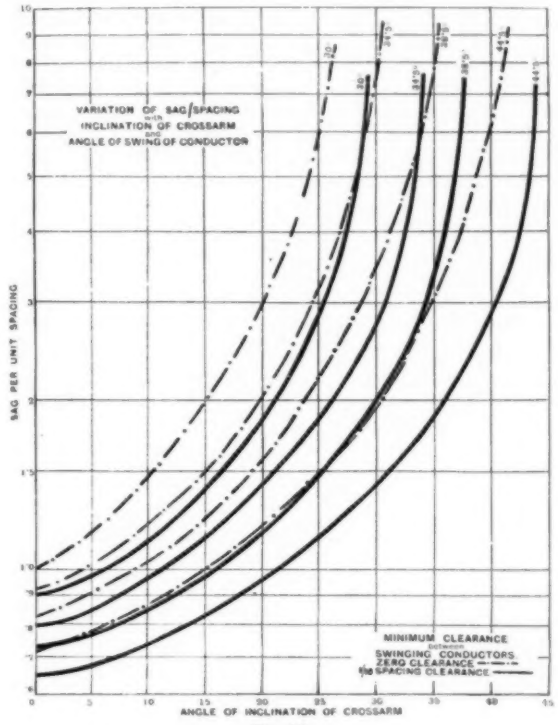


Fig. 15.

size similarly strung on any length of span, one carrying the full ice load specified by the Electricity Commissioners for e.h.p. lines, and the other no ice, is about 26 in. for the larger sizes of conductor, and 22 in. for the smaller. It is, therefore, necessary to have at least 22 to 26 in. vertical spacing according to size of conductor. The critical span for the smallest con-

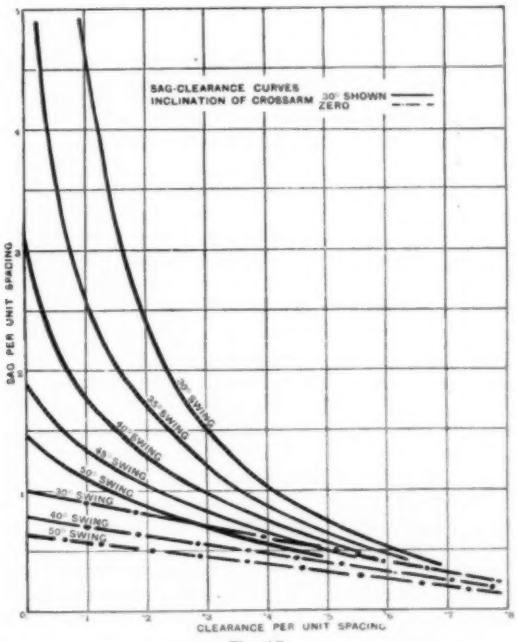


Fig. 17.

ductor under consideration (.05 sq. in. copper) is about 300 ft., and the maximum sag for this span is about 7 ft. (at 122 deg. F.); from fig. 15 it will be seen that two of these conductors on a 30-deg. cross-arm will clash when the ratio of sag to spacing is 2. The spacing of the conductors on the inclined sides of the triangle would, therefore, have to be 3.5 ft. (7 ÷ 2) to prevent clashing, and as we are assuming an equilateral mounting of conductors, the spacing of the two placed vertically would be the same, which would be ample to allow for unbalanced ice loading.

For the larger sizes of conductor the critical spans are over 450 feet, and the corresponding sags (at 122 deg. F.) are over 7 ft. Again referring to fig. 15, we find the ratios of sags to spacing are 3.3 for a .075 sq. in. conductor, and over for sizes above this for a 30-deg. inclination of cross-arm. Dividing 7 ft. by 3.3 we have practically 26 in. as the maximum spacing for

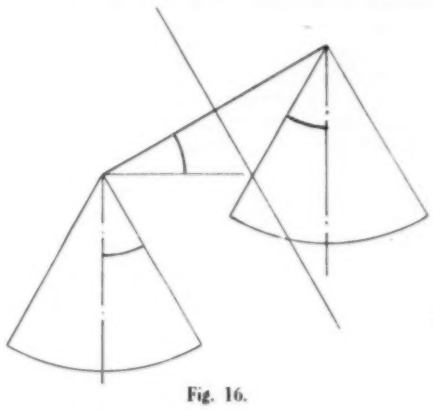


Fig. 16.

clashing. This figure is identical with the minimum required for the vertical spacing. For conductors of .1 sq. in. and over, however, the minimum (25 or 26 in.) required to account for difference in sags due to unequal loading is greater than the spacing necessary to avoid clashing by swinging, and must, therefore, be adopted as minimum spacing. The least possible equilateral spacing that can be used is consequently about 24 in., and any other arrangement of conductors will necessitate a greater mean spacing.

It is necessary in all instances to add a sparking distance to the clash spacing thus obtained. This distance is a function of the voltage of the line, whilst the clash spacing is a structural function: the two are entirely independent, and must be separately determined and added together to form the actual minimum distance apart at which conductors must be placed to be safe.

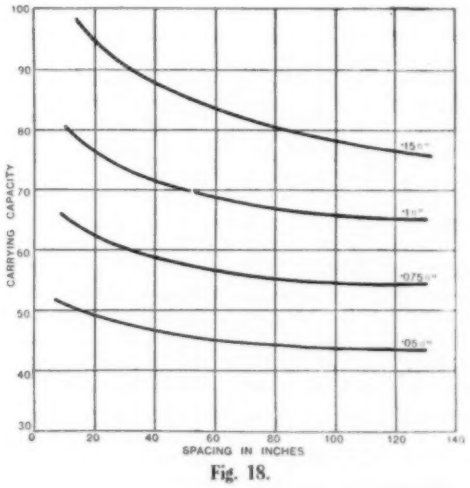


Fig. 18.

Fig. 17 shows the relation between sag, spacing and clearance for conductors swinging to various angles, when the cross-arm is inclined at 30 deg., and also when it is horizontal. Except where very large percentage clearances are demanded the inclined arm has a very decided advantage, and for any given factor of safety in regard to clearance between swinging conductors a smaller spacing may be used than with horizontal cross-arm or any other arrangement. The advantages accruing from this are both structural and elec-

trical: for any given conductor spacing greater sags, and consequently longer spans and fewer poles or masts, can be safely allowed with the arrangement of conductors described than with the more frequently used arrangement in which two conductors are placed on a horizontal cross-arm, and the third on the pole top, or conversely, for any given height of pole or mast a closer spacing of conductors can be safely employed.

Both "Wishbone" and "Herringbone" pole arms support the conductors in this ideal formation. The latter have the additional advantage of requiring no bird guards, and of carrying the continuous earth conductor without the use of a separate bracket. It may be mentioned that these arms fit the pole much more rigidly than the ordinary cross-arm, and with the herringbone type it is not necessary to slot the pole. Fig. 18 shows for four sizes of conductor how the carrying capacity of the line may be increased by decreasing the spacing. The improvement is more marked in the larger sizes than in the smaller on account of the higher ratio of inductance to resistance. There is a limit beyond which conductor spacing cannot be decreased as minima for other clearances will be reached, but full advantage may be taken of the tipped triangle mounting of conductors by reducing the spacing to a minimum and the span to a maximum. In determining the spacing it must be borne in mind that bird troubles are not entirely confined to birds causing faults between conductor and cross-arm. Swans and wild geese have flown into and become entangled in line conductors. An instance is known of wild duck clashing conductors together so that they burnt through on two occasions on the same line. Gulls have been found dead under lines after faults have occurred, the inference being that the conductors were bridged by the gull's wings. It is a common occurrence, on the other hand, for pheasants, partridge and ducks to fly into line conductors and be killed without causing any electrical disturbance when conductor spacing has been correctly gauged.

In designing short-span lines with large conductors where there is a tendency to reduce spacing to a small figure, it is well to remember that many of our common birds have a wing spread of 30 in. Small-conductor lines are less likely to suffer from this tendency, but it would be false economy to increase spacing so much as to eliminate the possibility of faults due to rare birds.

Errata.—On pp. 570 and 571, fig. 8 should be fig. 13, and *vice versa*. In Table II, test III, fig. 12 (both columns) should read fig. 10. In test VIII, for figs. 10 and 11 read figs. 11 and 12.

Pivot Friction.

The Cause and Effect.

By F. L. BEST.

There is probably no more important factor to be watched in the design and construction of a pivoted moving-coil galvanometer than the friction due to the pivots. Specifications for instruments have been known to run to great length in the careful stipulation of quantities and limits that will ensure a first-class piece of work being produced, and yet pivot friction, which will ultimately determine some of the most important essentials, never finds a place therein. It may be said, and quite rightly, that it is not for the purchaser to make any conditions with regard to pivot friction; that is left to the instrument maker. The purchaser in every case expects an instrument that is apparently frictionless, irrespective of its sensitivity. It will be readily appreciated that the magnitude of the pivot friction difficulty depends to a great extent on the sensitivity required. Having given the perfect pivot and the perfect jewel seating or bearing, the friction will be absent by definition, and any sensitivity is obtainable. However, it is not possible to produce perfect pivots, or to purchase perfect jewels, so that both these influence the result. A third factor is the weight of the moving system.

When one speaks of a pivoted-coil galvanometer, it must be borne in mind that the term embraces both ammeters and voltmeters, since a single galvanometer movement may be utilised for either of these by the suitable addition and arrangement of resistances.

In indicating instruments of the switchboard type, there is sufficient power available for fitting a galvanometer movement with robust control, and pivot friction is many times swamped out and can be altogether neglected. It is in instruments of a high order of sensitivity, where the control must of necessity be extremely light, that every attention must be given to the movement bearings. Theoretically, the factors which determine the sensitivity of the movement are (*a*) the number of turns of wire that can be put into the moving coil, and (*b*) the flux of the permanent magnet providing the field in which the coil moves.

Now (*a*) depends upon physical dimensions and the space factor obtainable. With regard to (*b*) the instrument maker is usually in the hands of the magnet makers, and beyond getting the best obtainable from the sources available, he cannot do much to improve the conditions. Let it be assumed then that a coil has been wound to the best advantage and the magnet flux is the utmost obtainable; what sensitivity can be obtained? Obviously no better than that corresponding to a control spring that does not show up the pivot friction.

Pivoted-coil galvanometers are divided into two classes, one being the ordinary square coil, common to most indicating instruments of the switchboard type, and the other being the somewhat special design due to Mr. Robert W. Paul and known as the "Unipivot" galvanometer. As the name implies, the latter, which has a moving coil of circular shape, is fitted with only one pivot, and it is necessary for good balance that the centre of gravity of the moving system is brought to the tip of the pivot (*i.e.*, to the point of support). The *Unipivot cannot be used in the vertical position, and therefore does not lend itself readily to switchboard work, except as a horizontal edgewise scale type. It has extremely good sensitivity, however, combined with robust construction. The important point to note in connection with this type is that since the centre of gravity of the moving system is at the point of support, it becomes necessary to add additional weight beyond what would be required in the same system if double-pivoted, in order to bring down the centre of gravity.

Pivots.

Pivots are usually made from what is known as blue pivot steel, which was known to clockmakers before galvanometers existed. Some makers have their own special specification for pivot steel, founded on experience and results that have come from many years' patient work. The main factors in the construction of the pivot point are—

(*a*) the heat treatment (hardening),
(*b*) the shape of the pivot point.

The heat treatment is most conveniently carried out in a small electric furnace, which may well consist of a refractory tube around which is wound a resistance heating element, the whole being well lagged externally with silica wool or asbestos.

The pivots can be contained in a cylinder, one end of which is open. At the required temperature the container is dropped bodily from the muffle into water for

* Now manufactured solely by Cambridge Instrument Co., Ltd., England.

quenching. The water is placed in readiness immediately beneath the muffle so that quenching is rapid. The thermal capacity of the container is kept low by the use of thin material in its construction. With a new batch of steel it is necessary to make sure that the hardening temperature which is usually employed holds good. This temperature is generally between 700 deg. C. and 800 deg. C., and will vary for different batches of steel and according to the subsequent treatment, &c. The accepted figure for working to is a little arbitrary, since it must vary from truth by an amount which depends upon the accuracy with which the couple of the

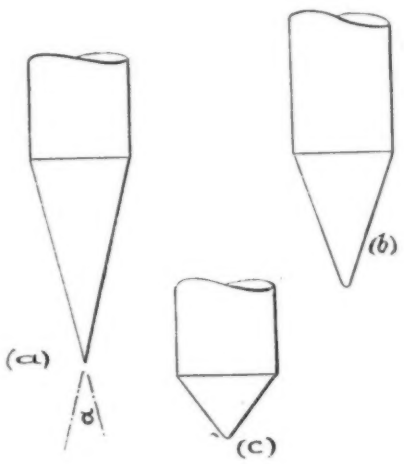


Fig. 1.

indicating pyrometer approximates to the actual temperature of the pivots in the container. It is only necessary for the operator to work to a temperature indication by the pyrometer that corresponds to success with the pivots.

The tests for a pivot can be various, but to be useful they must as far as possible impose the conditions under which the pivot will finally have to work, but in an exaggerated form. That is, the tests must cover a factor of safety over working conditions. One test is to take the finished pivot and see if it will scratch glass. This is by no means reliable, since pivots have been found to cut glass and yet be quite unsuitable for use in an instrument.

First, consider what a pivot has to do. It must stand a severe crushing stress and offer a minimum of resistance to rotational motion. The first of these conditions can only be fulfilled by careful dimensioning and proportioning of the angle and dome, whilst the second is a function of the jewel shape and polish, in addition to the polishing of the steel.

The shape of the pivot point and jewel cups might well be considered here. Fig. 1 (*a*) shows a pivot that would be useless under any conditions. The angle *a* is too acute and the tip is not domed. When the angle is too acute, there is little backing offered to the point of support, and unless this is of reasonable area, the crushing stress is quite outside the limit for the best material. Since the crushing stress is the result of dividing the weight of the moving system by the area of contact, it follows that there is a definite limit for the latter, fixed by the maximum crushing stress of the steel. Even then one must work with a factor of safety, and the minimum theoretical area is proportionately increased. The angle a varies in practice from about 85 deg. to 45 deg. Fig. 1 (*b*) and (*c*) show the appearance of such, and although these two look vastly different, they can be made to give the same results in practice when working in the vertical position as shown. In this position the balance of quality is in favour of the larger angle. The angle a must be large enough to give good backing and support to the dome, but the frictional properties of the pivot depend upon the radius of the dome and the degree of its polish. It will be obvious that if the dome of the wide-angle pivot has the same radius as the dome of the acute-angle pivot, then the friction due to each is the same, other things being equal. The correct doming of pivots requires considerable skill and experience. The angle is first put on by an Arkansas stone, and the dome is imparted in the process of polishing. Makers differ in their opinions of polishing agents, but it may be stated that very excellent results have been obtained with Diamatine. The radius of the dome is found by experience and judged by eye with the aid of the microscope; the actual radius of a good pivot dome is probably in the region of one-twentieth of a millimetre.

Reverting to the tests for a pivot after hardening, it is undoubtedly most satisfactory, when commencing with a new batch of steel, to finish off a small batch of pivots, say, ten, finally doming and polishing, before testing. This is on the assumption that the hardening process is considered as probably satisfactory for the new steel. Obvious cases of bad hardening can readily be detected by bending the pivots immediately they come from the quench. Soft steel will bend easily, and overhardening will be apparent from a brittle snap off. But the tests described below for the finished pivot will reveal the hidden secrets when other tests would indicate a satisfactory result which might not be realised.

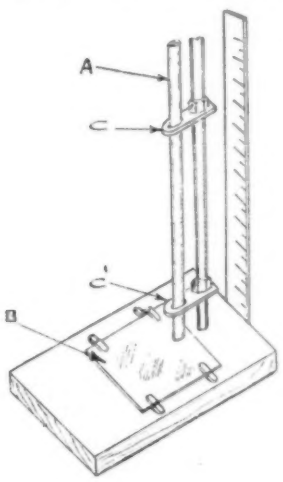


Fig. 2.

In fig. 2 a sketch is given of a simple piece of apparatus for applying what is known as the "drop test." The pivot is allowed to fall through the glass tube A and strike the glass plate B at the bottom. The height of drop is predetermined, A being changed to suit the pivots under test. The dropping height is found by experience for the particular pivot considered, of course. A microscopic examination follows the drop, and the qualities of the pivot are at once revealed. The tube A is a loose fit in the guides C, C', so that it is only necessary to lift this slightly, when the pivot falls out; it is a quick operation to test a large number of pivots with this apparatus.

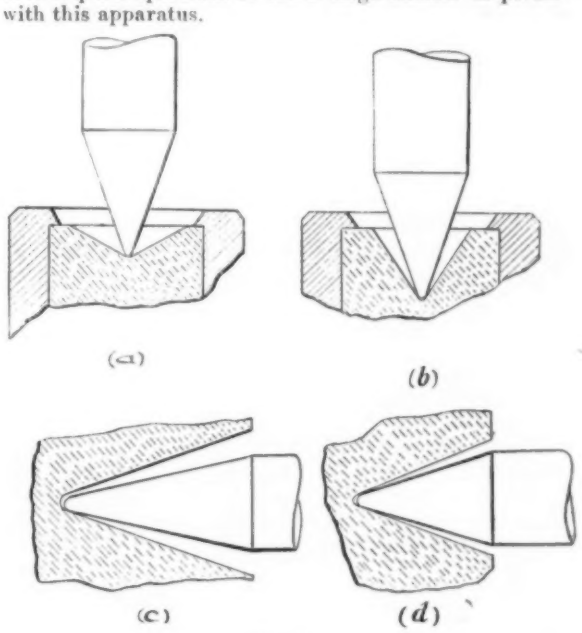


Fig. 3.

So far, what has been said refers to pivots designed to work in the vertical position, the weight of the moving system being taken by the domed tip. For instruments working in the vertical position, with pivots horizontal, other considerations arise. In the latter case it is not good practice to use a wide-angle pivot, for the reason that the diameter of the shaft becomes of identical importance as in the case of the ordinary machine plain bearing.

The frictional forces, since they cannot be entirely eliminated, must be made to work at as small a radius as possible. To this end, therefore, the angle should be made as sharp as possible, consistent with the facts that the movement has to be handled in assembly and transported. The doming can be of a lower radius than in the case of vertical reaction. The jewel cup must also be designed in conjunction with the pivot point; and what suits the vertical case will not suit the horizontal. In fig. 3 (*a*) and (*b*) are sections of jewels employed for vertical pivots, whilst (*c*) and (*d*) show those adopted for the horizontal type.

The polish of the pivot can only be tested by microscopic inspection, which can be done at the same time as the inspection for correct shape and dome.

The jewels require closer attention because it is not always easy to detect faulty jewel seatings. The microscope can be employed a good deal, but its effective use requires some experience. It is worth pointing out that the bottom of the jewel cup acts as a focus mirror, and actually produces an image in the cup. This can be easily tested by putting a jewel under the microscope. Bringing the objective slowly down towards the jewel, it will be found that a beautifully polished surface, which apparently reflects many objects above it, comes into sharp definition. If the travel of the objective is continued, however, it is found that this first surface fades out, and is replaced by the actual surface of the jewel floor, and no reflections are then visible. It is well known that a focusing mirror may have a bad crack or even a hole in it without affecting the image it produces. Such crack or hole will merely reduce the intensity of the image. Thus a bad jewel with a cracked or split surface will still give a good image in space, and therefore elude the inspector if he is not up to the trick of passing through the first image and striking the second.

For this reason a better inspection test for jewels is to traverse the surface with a fine needle point. A little experience will enable one to pick out the good jewels by this method.

Railway Electrification.

The Traction Department of the General Electric Co., Ltd.

An announcement was made in these columns some two years ago that the General Electric Co., Ltd., of Magnet House, Kingsway, and Witton Engineering Works, Birmingham, had made arrangements to add to its already extensive range of electrical activities the manufacture of plant and equipment for electric traction. While this class of manufacture cannot be developed so quickly as apparatus of less special nature, it is nevertheless gratifying to learn that the G.E.C. has made what is actually very rapid progress. As evidence of this, it may be interesting to deal with some of the more important traction contracts which have been entrusted to the Company, a number of G.E.C. traction equipments having now been sufficiently long in service to prove their merits.

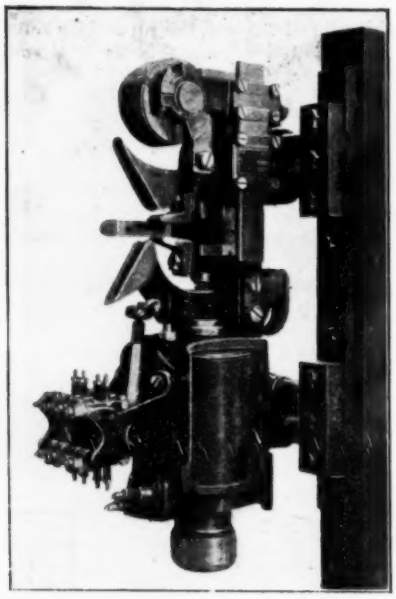


Fig. 1.—Traction Type Contactor, 400 A. 600 V: Side View. Arc Shield Removed.

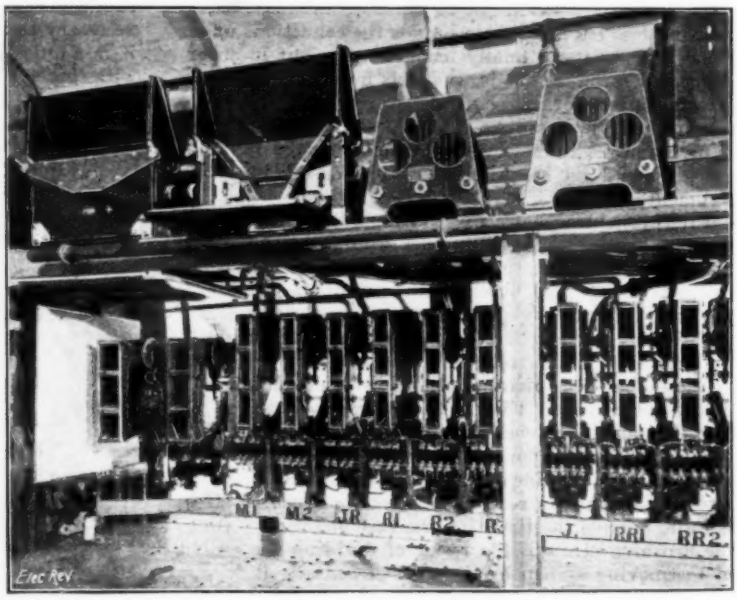


Fig. 2.—G.E.C. All-Electric Traction Equipment. Contactors in Motor Coach: Front View.

In proceeding to describe such equipments, we may direct attention to a working arrangement between the G.E.C. and the Oerlikon Company, of Zurich, Switzerland, which places at the disposal of the former the wide experience of the Oerlikon Company in the field of electric traction. This experience, coupled with that possessed by the General Electric Co.'s staff of traction engineers, places it in a most favourable position to deal with any electric traction propositions which may be in contemplation.

One of the contracts carried out by the G.E.C. was the supply of the complete electrical equipment for 21 motor coaches, 60 driving trailer coaches, and 20 trailing coaches, to the Southern Railway Company, in connection with the electrification of the Brighton section of the system. It will be recalled that a 25-cycle single-phase system is employed on this line, and many new features of considerable interest were added in the design and lay-out of the apparatus.

A comprehensive article dealing with the equipment of these motor coaches appeared in the Electrical Review of June 5th, 1925; it will, therefore, be unnecessary to go into detail in this connection. It may be mentioned, however, that each motor coach is equipped with four single-phase, series-compensated type motors with interpoles; they are self-ventilating, but external forced ventilation is also provided from the motor-driven blower. The output of each motor is 200 b.h.p. when running at a speed of 34.7 m.p.h. Fig. 3 is a side view of the motor.

Lubrication of these motors is effected by oil and wool waste packing, large oil containers being provided. The

brush-holders are of the "pistonic" type, and have renewable brush boxes, the brushes being easily accessible.

Two motor-blower units are provided for each coach, also one compressor motor for the brake equipments with governor and control gear.

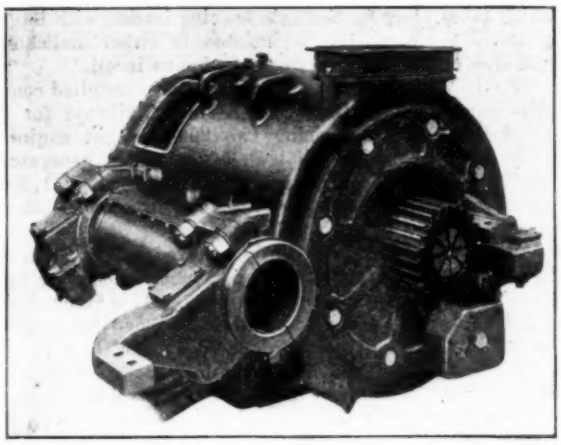


Fig. 3.—Motor for Brighton Railway: General View of Driving End.

The current is collected from the overhead conductor by duplex bow collectors. From the collector gear the current passes to the main oil switch *via* choke coils and two high-pressure fuses. One of these fuses protects the motor section of the gear and the other the auxiliary apparatus. The oil switch is provided with interlocks and overload releases which are in the form of a separate relay. The main transformer has four tapping points, which with the preventative coil give seven running notches. The auxiliary transformer is provided with tapping for supplying the blower motors, compressors, control and lighting.

Reversing is accomplished by means of four interlocked contactors, and acceleration is obtained by a further set of contactors fitted with the necessary interlocks; these are in duplicate for each section. All the contactors are of a similar type, and are operated by single-phase solenoids. At each end of the motor coach is a driver's cab containing the usual control gear, consisting of a master controller, driver's brake and emergency valves, switches for the control of the auxiliary apparatus and train lighting, and such miscellaneous gear as small lighting and control contactors, the guard's switch and lever regulator. The master controllers are provided with the usual dead-man's handle, which automatically switches off the current and applies the brakes by means of a pilot valve in the event of the driver releasing his grip of the handle. This feature, of course, is demanded in trains where only one man is in the driving cab.

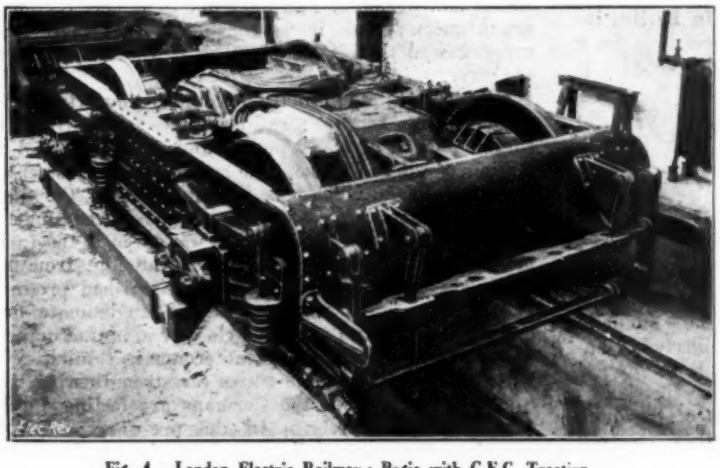


Fig. 4.—London Electric Railway: Bogie with G.E.C. Traction Motors in Position.

Another important contract carried out by the G.E.C. was the supply of rolling-stock equipment for the London Electric Railway. This contract comprises 97 motor-coach equipments, 78 control trailer equipments, and 55 ordinary trailer equipments. Each of the motor coaches is provided with two 240-h.p. d.c. motors running on a 600-volt supply. The control equipment is of the "all-electric" contactor type, each equipment consisting of contactors (fig. 1), reversers, circuit breakers, main fuses, main resistances, and the necessary auxiliary switchgear for the lighting, heating, &c., together with the master controllers and accelerating relays, as shown in fig. 2.

The arc chute of each contactor is built up in such a way that it is readily detachable in order to allow of more easy inspection or renewal of parts. The interlocks of the contactors—an important item—are of exceptionally sound construction, the fingers in particular being of an efficient design which permits of the stroke of the finger being adjusted independently of the pressure. The pressure of the finger is fixed before leaving the works.

The contactors supplied on this contract have a closing pressure distinctly greater than that which is usually provided: consequently they possess excellent current-carrying capacity. Their design is throughout exceptionally robust from a mechanical point of view, and consequently the maintenance of the contactor is reduced to a minimum.

Fig. 5.—London Electric Railway: Train fitted with G.E.C. All-Electric Equipments.

The control gear has been designed with a view to multiple operation with existing equipments, and the master controller is provided with a "dead-man's" device as described in connection with the equipment of the motor coaches for the Southern Railway.

We understand that 15 trains equipped with G.E.C. electrical gear are now running and giving satisfactory results. Views of a motor bogie and a complete train are given in figs. 4 and 5.

Another British railway contract which is being carried out by the G.E.C. is that for control equipment for the new London, Midland and Scottish Railway. This comprises the equipments for seventeen 4-motor coaches, 12 driving trailers and 12 ordinary trailers. Here again the control gear is of the "all-electric" contactor type, but the system employed differs from that on the London Electric Railway, being arranged to multiple with the existing equipments on the L.M.S. lines. The General

Electric Co. is also supplying a number of 300-h.p. motors for use with the new coaches, on these and the Liverpool-Southport lines.

In addition to the electrification of railways, the G.E.C. has supplied a large number of tramway motors to municipal and private undertakings in this country, amongst which may be mentioned Birmingham, Sheffield, Manchester, Leeds, Bury, Bolton, Rotherham, and

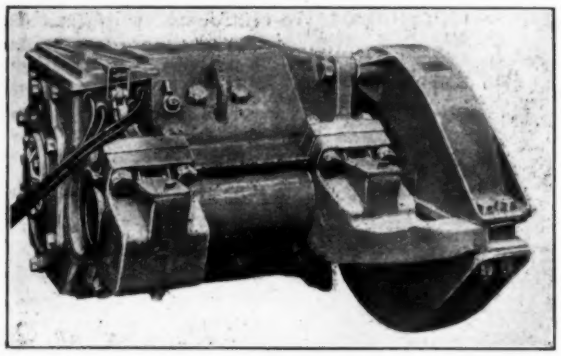


Fig. 6.—G.E.C. Tramway Type Motor. View from Commutator End.

Bournemouth Corporations, South Lancashire Tramways, &c. These motors are also made at the Witton Engineering Works of the General Electric Co., Ltd., and are of the company's standard types, W.T.31, W.T.32, and W.T.33 (fig. 6).

In the case of all these motors the drive is by single-reduction spur gearing to the driving axle. The bearings for mounting the machine on the axle are made integral with the motor frame, and the armatures have roller bearings so that the gear centres distance is maintained constant except for the small inevitable wear which takes place in the axle bearing bushes with lapse of time. All gearing is enclosed in either malleable cast iron or pressed steel cases, and runs in oil.

The General Electric Co., Ltd., has also supplied complete equipment to the South African Railways for a gas-electric car, comprising two 200-h.p. gas engines direct coupled to one 180-kW, 500-volt d.c. generator and the necessary control gear. The sets run at 1,000 r.p.m. The traction motors are four in number, each developing 80 h.p. at the 1-hour rating.

An interesting order recently received by the General Electric Co. is for one express passenger locomotive for the Great Indian Peninsula Railway. This locomotive will operate at 1,500 volts, and is designed for speeds up to 85 miles per hour. There will be three twin-armatured forced-ventilated motors, each developing 750 h.p. *i.e.*, 2,250 h.p. in all. The control equipment of this locomotive will be of the electro-pneumatic "unit-switch" type.

From the foregoing it will be realised that the General Electric Co., Ltd., has had considerable experience with a number of varied electrification schemes, and is in a favourable position to deal with any scheme that is likely to develop in the future, in connection with traction electrification in the United Kingdom and throughout the world.

The Industrial Situation in Germany.

The electrical industry in Germany was so fully dealt with in the special publication issued by the British Electrical and Allied Manufacturers' Association, of which an abstract was given in this journal on August 20th, that very little scope would remain for any complementary information on this subject to be added in the meantime. For that matter, the only information on the electrical industry—and that, too, solely regarding the supply of electricity—occupies two pages and a half in the report* published by the Department of Overseas Trade on the economic and financial conditions in Germany in 1925-26, apart from a tabular statement of the value of the distribution of the exports of electrical manufactures. As in former years, the report has been prepared by Mr. J. W. F. Thelwall, M.C., commercial secretary in Berlin, assisted by Mr. C. J. Kavanagh, now also commercial secretary in Berlin, instead of Cologne. Under the circumstances, besides a brief mention of the question of electricity supply, it will only be necessary to give a short survey of the general situation, while at the same time endeavouring to avoid any repetition of the contents of the beforementioned report of the B.E.A.M.A.

The report, which is brought down to the end of May or June of the current year, in some cases states that during the last sixteen months Germany has passed through what will probably prove to be the severest stage of her post-war inflation recovery. It was sharp but short, and the country has once again shown its remarkable power of recuperation. The financial stresses to which German industry was subjected, combined with a depressed home market and keen foreign competition, caused manufacturers to survey their position in earnest, and to initiate a process of thorough re-organisation; and in this endeavour they received far-reaching support from the Government. In fact, it may be said that the second outstanding feature of the period under review, next to or following upon the shortage of credit and working capital, was the completion of the process of budgetary and currency reform, and the concentration of all energies on the promotion of commercial and industrial efficiency. The means adopted were the elimination of unnecessary staff and plant and of weak and unprofitable units within the various classes of production, the formation of trusts and combines, the conclusion of international agreements, and State aid in the form of cheap credits and the reduction of taxation. In looking back over the past three years, the report expresses the opinion that one cannot but be struck by the evidence which they furnish of Germany's inherent economic strength. It is submitted that there is hardly another country of similar industrial importance which could have overcome, with such comparative ease and with so little internal disturbance, the complete destruction of its currency, nor passed with equal rapidity through the subsequent period of necessary but extremely trying reorganisation; and it is considered that there seems every reason to feel confident as to the future of the country.

Concerning the elimination of unremunerative undertakings, the report mentions that apart from the shutting down of many potash and coal mines and the closing of works for the same reason by many steel and electrical firms, much was accomplished in the direction of economical working by means of combination. But whereas formerly preference was given to the fusion or association together of works producing from raw materials right up to all classes of finished products, the present system is to connect or amalgamate firms engaged in one and the same class of manufacturing so as to ensure the most efficient economic results. Notwithstanding all these measures for strengthening their competitive capacity, the Germans are feeling foreign rivalry very severely. In the pre-war period the practice was essentially to fight for and conquer markets. To a large extent this tendency has been replaced by a strong advocacy of international co-operation, on the one hand between nations by uniformity of Customs treatment, reduction of duties and ultimately Customs union, and on the other between similar branches of industry by direct private negotiation. So

*Stationery Office, price 4s. 6d. net.

far results have only been achieved in the case of the Franco-German potash agreement, the electric lamp agreement, the gas mantle agreement, the international explosives agreement, and artificial silk agreements. One of the great aims of German industrial policy, however, is to bring about a European iron, steel and coal combine in respect of sales and production. In the case of steel ingots, a pact between Germany, France, Belgium and Luxemburg has already been signed, if it has not actually been brought into operation by the time these lines appear in print.

In the course of the general review of the iron and steel and allied industries, it is pointed out that the iron and steel industry completed a noteworthy performance in 1925. For the whole year the output of steel ingots exceeded 12,000,000 tons, while in Rhenish-Westphalia alone there was a recovery to the production which was attained in 1913. In external markets, to which Germany exported over 3,000,000 tons, conditions were scarcely encouraging, as the general price level was dictated by the competition of her Continental rivals operating under the "exchange premium." The report recalls the grant of rebates by the Steel Ingot Syndicate, acting on behalf of itself and its associated syndicates, to home consumers on materials purchased by them exclusively for conversion into export manufactures, and at the same time binding such consumers to the acquisition of home materials only; and it refers also to the concentration of a large amount of attention on the so-called "rationalisation" of the production, that is to say, the operation of units of a group in such a way as to attain the maximum efficiency in working. As a special instance, mention is made of the now well-known Ruhr steel trust (Ver. Stahlwerke, A.G.), which is composed of a few of the more important coal and iron and steel works, of which details are subsequently given.

The engineering trades of Germany are discussed in less than one page of the report. In this connection it is mentioned that there is scarcely any branch which cannot show a vastly increased manufacturing capacity carried out under the stimulus of inflation, and in consequence of the saturation of the home market, the engineering shops, since the inflation period, have experienced a restriction in the home demand. A review of the situation for 1925 suggests that conditions have been painted blacker than seems justified. The foreign trade figures show that last year Germany exported a higher value of machinery than in 1913, while from the standpoint of output, it is estimated that the engineering industries produced about 80 per cent. of the pre-war tonnage, which cannot be considered too bad a performance under the circumstances. The impression is gained that German makers have regained their competitive power, which they lost for a short time on the introduction of the gold mark, and their chief difficulties are not to be found in the prices of raw materials and the cost of labour, but mainly in the sphere of finance. The report proceeds to deal with the potash, chemical, motor-car and shipbuilding industries, and then comes to the subject of fuel and power supply. On the question of the production of coal, it is noted that this closely approximated last year to that in 1913 within the same territorial frontiers, that the average output per shift per miner was 10 per cent. higher at the end of 1925 than in the pre-war period, and that the exports from the Ruhr basin as the principal centre of production were higher by over 3,000,000 tons last year than in 1913, including deliveries on reparation account. Since then the export trade has further developed as a consequence of the coal trade troubles in Great Britain.

Dealing with the subject of electricity supply, the report states that the movement towards concentration made further progress last year. The Federal States, as well as the Reich and private enterprise, competed for the first place in the system of electricity supply. As a result of disagreement of the parties concerned, and as the questions connected with the various schemes are still far from being settled, the report merely gives an outline of the development. It is, however, mentioned that the prices of power to large consumers are below the pre-war level, amounting to between 3 and 4 pfennigs per kilowatt-hour; but the rates are higher than in 1913 for small consumers, being between 20 and 34 pfennigs, those between 20 and 24 pfennigs prevailing. On the other hand, the tariff charges for lighting are between 40 and 54 pfennigs per kilowatt-hour.

Mention may be made in conclusion that the report also discusses the questions of transport and communications, shipping, and various phases of the labour problem, being complemented by statistical information bearing on the different subjects raised throughout the report.

The Electric Drive in Coal Washing.

By J. C. KNOWLES, M.A.

Among other improvements in the reorganisation of colliery surface plant, the concentration of coal washing into larger units serving several pits gives an opportunity of effecting economies in handling and of giving a cleaner small coal at less cost. From an electrical point of view, the introduction of new washing plant means new business in motors, &c., for the various drives, a short description of which will therefore be of particular interest to electrical manufacturers.

The first unit will comprise a wagon tippler and elevator. The tippler motor can be intermittently rated (say, 5 h.p.) series wound (d.c.) or high torque squirrel-cage (a.c.). In either case drum controllers can be used, but, to save the heavy duty of inching the wagon into position for removal after tippling, a limit switch can be arranged to stop the wagon in the correct position each time. The elevator, if of the bucket type, can be run continuously at a constant speed with a compound-wound or squirrel-cage motor (say, 10 h.p.) with a hand-operated starting panel or auto-transformer starter. A remote stop push button may be useful at the top end if the starter is fixed on ground level near the tippler.

The water for washing can be used over and over again if a silo and circulating system are arranged. The used water can be drained into a sump and lifted by a centrifugal pump into the silo, the pump motor being automatically controlled from a float switch in the sump through a reliable automatic starter. Make up water can be supplied through a ball valve in the silo. The finest dust will be held in suspension in the water, and will settle in the silo, from the bottom of which it can be flushed over a fine gauge screen to collect this very small coal (or duff).

The incoming coal from the elevator is shot into the primary washing box where, in addition to the force of the incoming flow of water, a turbulent circulation can be obtained by injecting compressed air, or in smaller plant by reciprocating plungers. A motor drive will be required unless a supply of compressed air is available from another place, the motor being rated for continuous duty as long as the plant is in operation. A duplicate drive is required for the second agitation in the rewasher, which reclaims the duff coal which is too small to remain on the screens that catch and sort the coal washed over from the primary washer. This duff coal can only be reclaimed by settlement in a tank, so that another small motor-driven elevator may be required to lift the sediment to the rewasher.

The washed coal will fall through the screens into bunkers, each grade (pea, bean, nut or duff coal) being automatically separated on the screens, and the bunkers being emptied by gravity into wagons.

The dirt from the washing boxes must be carried away, and as the dirt falls to the bottom it must be lifted above water-level by elevators discharging on a horizontal conveyor to carry the dirt away to a bunker from which it may be loaded into wagons or carried by telpher to a dumping ground. For these elevators, conveyors and telphers, motor drives are required to deal with 50 tons or more per hour. The telpher, however, may handle not only the dirt from the washed coal, but also the rubbish brought up from the pit, and may then have to carry 100 tons an hour and require a driving motor of 100 to 200 h.p., according to the height of the dumping ground.

To summarise, the motor drives required will comprise a number of small motors for conveyors and elevators, a medium size pump motor, and probably a large motor for telpher work. The control-gear will comprise a reversing drum controller for tippler, an automatic panel for pump motor, and starting panels for elevators, conveyors, and telpher.

The above is a brief account of the electrical requirements of coal-washing plant, indicating generally the knowledge of mechanical process work which manufacturers and salesmen of electrical plant need more and more to understand so as to give good service to their customers—and to obtain orders for themselves.

The First National Radio Exhibition.—V.

A Review of the Exhibits.

Although no apparatus embodying fundamentally new ideas was evolved during the 1925-26 season, real progress has been made in the design and refinement of broadcast receivers and component parts thereof.

One of the most unconventional sets was shown by Cleartron Radio, Ltd., incorporating Sir Oliver Lodge's "N" circuit arrangement, which is claimed to be non-radiating and non-interfering. It is made in 2- and 3-valve models, both of which are controlled by means of a single dial and guaranteed; constructors' kits for this circuit are also obtainable.

A powerful set that attracted attention was the 7-valve "Neutrosonic" of the Igranic Electric Co., Ltd. The oscillator and h.f. transformer units are made interchangeable in order that a wave band of from 250 to 1,800 metres may be covered; "Pacent" square-law condensers are used, and the portable battery box matches the set. New wander plugs and terminals with non-rotating tops were included in the display, together with a three-valve resistance-capacity amplifier, of which a novel feature is claimed to be the means by which volume is controlled. The first grid-leak is of similar construction to the Igranic high-resistance potentiometer, and variations of the resistance enable smooth control of volume to be effected. This method does not affect the purity of tone which is characteristic of the amplifier and has the further advantage of preventing the loud-speaker being overloaded by very loud signals. The whole amplifier is built upon a moulded Bakelite base, measuring approximately 11 in. long by 4½ in. wide by 1½ in. high, compact and neat in appearance. High voltage and grid bias can be applied to the amplifier in two values, so as to permit of the use of a power valve in the last stage. High-pressure mains units are made in two patterns, both designed to operate off a.c. circuits at 110 or 220 volts at 40-60 cycles. Model V.208 is capable of a maximum output of 30 milliamperes, and a maximum output voltage on load of 200 V, tappings being provided at approximately every 25 volts. Model V.123 has a maximum output of 20 milliamps., and a maximum output voltage on load of 120 volts, with tappings for the detector valve at 22, 30, 46 and 60 volts approximately, and for the amplifier at 80, 100 and 120 volts. They employ full-wave rectification, and are contained in metal cases. The low-pressure unit operates off a.c. mains at 110 or 220 volts at 50-60 cycles. It can be supplied for delivering 2, 4 or 6 volts. The maximum current output is 1.5 amps., and each unit contains a voltmeter.

Thermionic valve manufacturers were well represented, and the several recently-introduced a.c. rectifiers must be mentioned, such as the "Osram" and those of the Mullard, Marconi, and Burndept Companies. The last-named firm's "HL425" valve have a distinctly superior h.f. performance, whilst its "LL525" is an economical last stager and will be hard to beat when employed with a suitable loud-speaker. In the "Cossor" range three recent patterns are of the 2-volt class, and the point of interest is the method of suspending the filament; it is arched and held in position by a fine wire, but is not in tension, the result claimed being a shock-proof filament. Jointly produced by Standard Telephones and Cables, Ltd., and B.S.A. Radio, Ltd., a number of new valves containing heavy strip filaments operating at a low temperature were shown. The pins with which they are fitted are cut through (the incision not quite reaching to the ends) so as to impart slight expansion about the middle and produce a spring contact with the socket.

The Edison Swan Electric Co., Ltd., has increased its range by the introduction of a "½-watt" group in the 2-volt 0.1 A class. Devoid of eccentricity, they include the "RC.2," which was designed solely for resistance-capacity coupling, and has the unusually high amplification factor of 30 and impedance of 150,000 ohms, the slope being 0.2 mA per volt; it is important that the anode resistance shall be between 1 and 5 megohms and that the filament current be kept as small as possible.

Three new valves of the British Thomson-Houston Co., Ltd., are a "B.2" general purpose bright emitter and a "B5H" dull emitter smilar to the "B5," with a "B4H" companion, which is intended to operate with a high external anode impedance, such as when tuned-anode, resistance, choke, or low-ratio l.f. transformer coupling is employed. The B.T.-H. 3-valve "two-station" receiver is provided with a change-over switch for the convenience of users who have no interest in the method of obtaining results, but simply desire to hear the local and long-wave stations without the necessity of altering the controls once they have been set. The Company's form "RK" speaker might be more aptly termed a reproducer that responds to a wide range of acoustic frequencies. Based on a principle which, though not new, is not usual, its original feature is the incorporation of a power amplifier in the speaker cabinet. The instrument consists of a moving coil in a magnetic field, the conical diaphragm being practically unsupported at its edges. It is understood that an air-tight barrier is, however, placed around the edge in order to minimise interaction between the sound waves emitted by opposite sides of the diaphragm; moreover, the latter is mounted in the centre of a large cabinet so that the entire front board assists in reducing interaction. A polarising field is maintained by four pairs of permanent magnets, about 8 in. long by 1¼ in. wide and nearly ½ in. thick, arranged in pairs. Batteries are dispensed with, a 2-valve full-wave rectifier being embodied for operation off a.c. lighting mains, or a smoothing and voltage-regulating circuit in the case of a d.c. supply being used.

The Halcyon Wireless Supply Co., Ltd., specialises in the manufacture of portable receivers, both with and without self-contained loud speakers, all batteries being contained within the cabinets, with an internal frame, and we understand that the manufacturers are prepared to give a definite guarantee of loud-speaker reception without any external connections 50 miles from main

Fig. 1.—"Halcyon" 5-V Portable Receiver.

B.B.C. stations and 300 miles from Daventry. A new De Luxe model employs 2 h.f., 1 detector and 2 l.f. 2-volt dull-emitter valves, and the h.f. side is coupled by one tuned and one untuned transformer, only two controls in the form of slow-motion dials being used. The set is turned on and off by means of a single switch and a "tell tale" lamp on the panel prevents the set being inadvertently left switched on for a considerable period. The set has a self-contained speaker (fig. 1) with a new type of neck and horn attached to a movement of the "Amplion" brand.

One of the smallest super-heterodyne set seen at the show was that of Messrs. Autoveyors, Ltd.; measuring

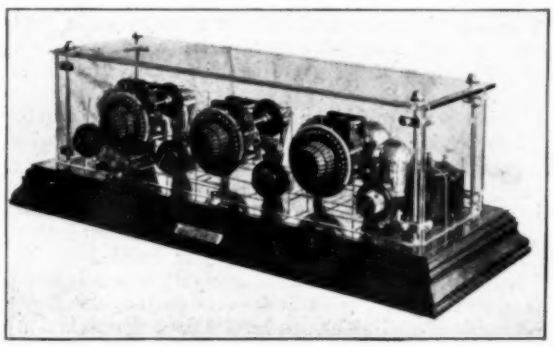


Fig. 2.—The "Langham" Glass-cased Set.

15 by 9 by 6 in. and weighing 23 lb., the outfit comprises separate oscillator and detector valves with three intermediate h.f. and one l.f. stages, seven valves in all. The batteries and a "Celestion" loud-speaker are contained in a separate case of similar dimensions and weighing 25 lb. Of unconventional appearance is the Langham model, fig. 2. The panel, sides, back, and top are made of plate glass held together by plated

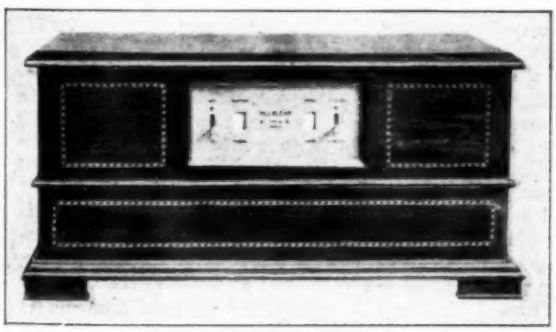


Fig. 3.—The "All-Clear" Receiver.

screws and fittings, the top being easily removable to allow access to the interior. The circuit is straightforward, utilising three valves.

Messrs. W. Dibben & Sons are the proprietors of the "Allclear" tri-coil unit, which dispenses with the usual type of moving coils, but reaction is constant on two circuits; it is claimed that reaction never affects the aerial tuning, but merely controls volume. The set is tuned in metres, the reading being visible through a small window in the gilt-finished brass panel, fig. 3; tuning is effected by a small knob in a slight recess at the end of the cabinet.

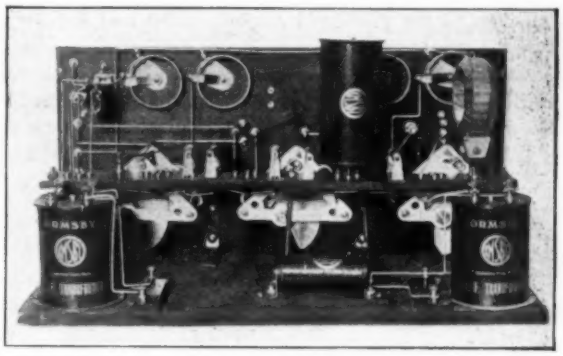


Fig. 4.—"Ormsby" 4-Valve Long-range Set.

A speciality of Ormsby & Co., Ltd., is a 4-valve long-range set, fig. 4, the construction of which is simplified with the aid of a cardboard model which is produced for the convenience of the home constructor. The reaction unit used (fig. 5) is also made as an aerial tuner with reaction, and another variation has a condenser built into the body.

The "Quality Two" receiver has been designed by S. A. Lamplugh, Ltd., for those who do not desire to be bothered with technical adjustments. A new slow-motion straight-line condenser is made of aluminium, with a reduction method that gives a very fine movement; a new potentiometer embodies the buffer method of contact, and the "Varo-fix" filament resistance is wound in the form of a cartridge which is pressed into a spring holder that permits of different values being used, while each resistance element can be varied to suit the particular valve it is working with.

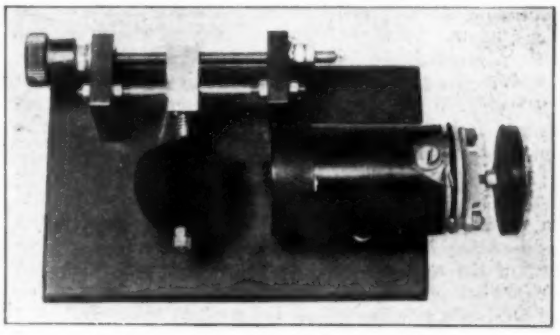


Fig. 5.—Universal Aerial Tuner, Reacting.

Recent products exhibited by the General Electric Co., Ltd., included several interesting devices. The receiving sets are of particularly good appearance; a 3-valve set employs no plug-in coils or other interchangeable units for tuning, the change-over from long to short waves being controlled by a switch on the panel. The cabinet is made of mahogany, and harmonises with a "mahoganite" panel and oxydised bronze fittings. The set is very simple to operate; the usual dials have been dispensed with and are replaced by one station indicator in the centre of the panel, which rotates through a friction-driven reduction mechanism operated by a large knob. The setting of each station when obtained is recorded on the indicator, and thus forms a permanent chart. Straight-line condensers are new components; the ratio of the reduction friction-gearing is 30 to 1, the slow-motion device being interchangeable with the standard 12 to 1 gearing fitted to "geecophone" square-law condensers.

D

The Combustion of Low-Grade Coal.

Some Suggestions for Firing Boilers during the Coal Shortage.

By J. N. WAITE, M.I.E.E.

One effect of the prolonged dispute in the coal industry is that a considerable amount of low-grade fuel is being marketed for steam-raising purposes. Under normal conditions, much of the coal that is now finding a ready sale would be quite unsaleable at any price. Quite a lot is actual "pit mound," that is, mine refuse, which has been dumped in the past because no market existed for it.

The generally accepted meaning of "low-grade coal" is coal having a gross calorific value of about 11,000 B.th.u. per lb. and under. Such coal will have an ash content from about 18 per cent. upwards.

For many years now considerable attention has been given to the utilisation of low-grade coal for steam-raising purposes, with the result that special grates and special methods of using low-grade coal effectively have been developed and put into use. Most modern boiler plants are suitably equipped in this respect, but there are still a large number of power plants that have furnace equipments only suitable for burning relatively good-class coal. The present situation will doubtless have the effect of increasing the demand for furnace equipments suitable for dealing with low-grade coal, with the effect that the pioneers will find the advantages they gained by utilising low-grade, low-priced fuel, somewhat decreased by the incidence of the law of supply and demand.

It has been found that with the ordinary chain-grate stoker equipped with induced draught only, as the quality of the coal goes down, the possible boiler output and the boiler efficiency fall off, and eventually there comes a point beyond which the fires cannot be maintained at all. This point depends primarily upon the ash content of the coal. As the ash content increases the furnace temperature decreases and the unburnt-fuel loss to the ashpits increases, resulting in a lowering of output and efficiency. This holds good whatever form of furnace equipment is installed. There is a limit to the ash content of coal, beyond which it cannot be burnt effectively. With the ordinary chain-grate, induced-draught stoker this ash-content limit will be found to be usually round about 25 per cent.

The limitations of the ordinary chain-grate, induced-draught stoker in this respect caused the development of the compartmental, forced- and induced-draught chain-grate stoker, and also to some degree the development of the underfeed retort-type stoker, and the pulverised-fuel method of firing. These developments enable coal having a relatively high ash content to be effectively used. The two latter types are installed in relatively few plants in this country, and, therefore, will not be dealt with here.

The effect of the compartmental, balanced-draught, chain-grate stoker is to enable a lower grade of coal to be burnt than is the case with the plain induced-draught, chain-grate stoker. This has led to the widespread adoption of the compartmental type. It should be pointed out, however, that this type is designed specially for burning low-grade coal, and if good-class coal is used, it will not give any better results from an efficiency point of view than the ordinary induced-draught type, while the maintenance costs will be greater, and the first cost is considerably higher.

The simplest method of dealing with low-grade coal is to use it as an adulterant to good-class coal. In this case very little alteration to the ordinary methods of firing is necessary, so long as the good-class coal forms a substantial proportion of the whole. The vital point to be ensured is that the two classes of coal must be really intimately mixed before they reach the grate. This cannot be done by putting alternate loads of good and poor coal into the bunkers. The allotted portions must go into each bucket, or into alternate buckets, of the conveyor. Real intimate mixing is essential for success, when dealing with a mixture of coals. If the mixture is not intimate, then trouble on the grates will certainly ensue. Both classes of coal must, of course, be of a size suitable for chain grates. The best proportions to use have to be found by experiment with the actual coals.

Where an appreciable amount of low-grade coal of relatively large size is available, coal crushers may be installed in the coal-handling equipment.

The ordinary method of operating a chain-grate stoker with good-class coal, having a relatively good volatile content (that is, free-burning coal), is to run with relatively thin fires—say, 3 in. to 4 in. thick—and with a relatively high grate speed. It is unimportant whether balanced draught or induced draught only is used, from the point of view of output and efficiency. The design of the refractory brickwork is also relatively unimportant. This method can be made to give excellent results when dealing with relatively good-class coal.

As the quality of the coal goes down and the ash content increases, to get satisfactory operation it becomes necessary to thicken the fires, and to slow down the grate speed. The design of the arches becomes important, forced draught is decidedly advantageous, and control of the forced-draught pressure over various separate sections of the grate enables better fires to be kept.

With low-grade coal the minimum fire thickness will be found to be about five inches for effective burning, with the grate speed reduced accordingly, and the draught increased correspondingly. The lower the grade of the coal, the thicker must be the fires, and the slower the grate speed. The need of thicker fires applies whether induced draught only is available, or whether forced and induced draught (balanced draught) is provided.

As stated earlier, with induced draught only, the lowest grade of coal which can be effectively burnt is that having an ash content not exceeding about 25 per cent. When balanced draught is available, coal having an ash content of up to about 35 per cent. can be effectively burnt. In both cases the possible boiler output will be reduced, and the boiler efficiency will be appreciably lower than with good-class coal.

When balanced draught is available, to get the best results it is essential to keep the draught really balanced over the fires. This means that the maximum possible forced draught, and the minimum possible induced draught, is being used for the conditions obtaining. A suction draught over the fires should be avoided at all times when dealing with low-grade coal.

The brickwork setting known as the "Welsh setting" is a material aid in burning low-grade coal. This setting, as its name implies, was developed to deal with anthracite small coal, which, owing to its low volatile content, is difficult to ignite and burn with the ordinary type of arch. The "Welsh setting" consists essentially of keeping the arch to beyond ignition point as low as possible, extending the flame arch as far as is practicable, in conjunction with a steeply upward inclined reverberatory arch at the back of the combustion chamber over the ash dumpers, and the grate set on a downward incline. Many modified forms of this setting can be readily designed to suit special cases.

When burning low-grade coal it is absolutely essential to keep the furnace brickwork at a high temperature. In watching the fires special attention is necessary, as one of the first signs of the fires going back is given by the temperature condition of the brickwork. If the temperature of the brickwork begins to fall,

it is useless to speed-up the grates or to increase the induced draught.

If this is done it will most probably result in the total loss of the fires. The brickwork temperature should be brought up again by slowing-down the grates, reducing the induced draught to a minimum, and increasing the forced draught. The brickwork temperature must be brought up, even if it becomes necessary to reduce load to do so, the alternative being the total loss of the fires and a complete shut-down. Given proper attention, the normal load can be carried, though the boiler efficiency will, of necessity, be somewhat lower than with good-class coal. In normal times this loss of efficiency would be more than compensated for by the difference in price of good-class and low-grade coals, but this does not hold good at present, due to the supplies of fuel being severely restricted.

A further aid to dealing effectively with low-grade coal which contains an appreciable percentage of dust or very fine coal, and in addition is relatively very dry, is to moisten the coal with water sprays fitted to some convenient point, such as the boiler hoppers, or the feeder shoots. Theoretically, this addition of water will lower the boiler efficiency, but in actual practice it will be found to have the effect of increasing it, due to the fact that the small coal, when wetted, is not blown off the grate, and keeps together better, resulting in more even fires, better burning out, and a higher percentage of CO_2. The gain due to these causes usually outweighs the loss due to the addition of water. As to when it pays to wet the coal, this can only be found out from experiment on the actual coals that are being used. Wetting is only necessary when the coal is dry and contains an appreciable proportion of very fine particles. The loss of efficiency due to added water is relatively small. For instance, 10 per cent. of added water would increase the flue loss by about 120 B.th.u. per lb. of coal, with an exit gas temperature of 400 deg. F. With coal of 10,000 B.th.u. per lb. this represents a loss of 0.12 per cent. for each 1 per cent. of water added. It is fairly obvious that it does not need much improvement of the fires to outweigh the slight loss due to added water. Improving the CO_2 from 10 per cent. to 12 per cent. decreases the flue loss by about 1.8 per cent., for a final exit gas temperature of 400 deg. F., so that if wetting the coal enables better fires to be carried, it is a commercial proposition to do so.

The substitution of low-grade coal for good-class coal calls for considerably more skill and attention on the part of the boiler-house staff if successful results are to be obtained. It also calls for suitable equipment. There is a limit to the lowness of the grade that can be used. This limit varies with the type of furnace equipment, and also, to some degree, with the experience and skill of the operating staff. The results obtained in many power plants have conclusively demonstrated that low-grade coal can be burnt effectively.

When normal conditions exist in the coal industry, low-grade coal can be bought at a very low price. It would appear probable that the demand for low-grade coal will increase as power-plant users realise the economic gains to be obtained by the utilisation of low-priced, low-grade coal. This increase of demand will lead to an increase of price, but taking this into account, it would appear that it will be to the interest of power stations for many years to come, to install the necessary suitable equipment for burning low-grade fuel, and to get the staffs experienced in dealing with it.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Next Issue.—As the next number of the ELECTRICAL REVIEW (October 22nd) will be larger than usual, devoted to the whole subject of Domestic Electrification, special printing arrangements are necessary. The pages will be closed earlier than usual, and all editorial news, correspondence, &c., must be in our hands a day in advance of the regular time. Our Advertisement Department announces elsewhere that no Official Notices or small advertisements can be inserted in the issue for October 22nd unless they are received here by the first post on Tuesday, October 19th.

Gas v. Electricity.—The Efficiency Club has organised what should prove to be an interesting discussion on "The Relative Fields and Merits of Gas and Electricity." It will take place on Friday, November 19th, at 7.30 p.m. for 8, at Vernon House, Park Place, St. James' Street, S.W. Mrs. M. L. Matthews, Grad.I.E.E., will be in the chair, and the principal speakers will be Mr. F. W. Goodenough, representing gas, Miss C. Haslett, Director of the Electrical Association for Women, and Mrs. Laura A. Willson, house builder. No tickets will be required.

Proposed Electricity Cartel.—The Brussels correspondent of *The Times* reported, on October 8th, that M. Loucheur had visited Brussels the previous day, and it was stated in Brussels that his object was the formation of an electricity cartel similar to the steel cartel. "It is impossible to obtain confirmation of this report, but there is reason to believe that M. Loucheur has in mind the conclusion of such a cartel."

Local Exhibitions.—SHIPLEY.—The Electricity Committee has arranged an electrical exhibition at Victoria Hall, Saltaire, from October 11th to 22nd.

NEWTON ABBOT.—An electrical exhibition organised by the Torquay Electricity Department was opened by the deputy-Mayor of Torquay on Monday last; it closes to-morrow (Saturday).

Lead.—Reporting on October 9th, Messrs. James Forster and Co. stated:—"There has been no new feature this week. In this country consumption is not active and demand is slow, and it is now doubtful whether there will be any revival this year. Continental demand is quiet, while in America, under the influence of Wall Street, an easier tone has set in, the price of lead there having been reduced to 8.50 cents per lb. It seems probable that little change in present conditions will be witnessed in the near future, and that prices will fall still further before any permanent recovery takes place."

The E.D.A.-E.L.M.A. Campaign.—The Edinburgh Corporation on October 7th approved a recommendation of the Electricity Committee that it should make a contribution of £200 towards the expenses of the campaign.

Arrangements have been made by the Halifax local committee to organise an all-electric house, and it is hoped also to equip various other houses with electrical household appliances for demonstration purposes. Mr. H. Birkhead is the chairman of the local committee, Mr. E. Hunt vice-chairman, and Mr. F. H. Wilcock, of the Corporation electricity showrooms, secretary and treasurer.

For Sale.—The Superintending Engineer R.A.F. Depôt, Uxbridge, invites offers for several small generating sets, switchboards, and motors of various makes and sizes, cable, &c. The Director of Army Contracts invites offers for one Tudor battery, 122 cells, 1,500 Ah, with switchgear and booster, and one large marine-type Babcock & Wilcox boiler. Winchester Corporation Electricity Committee has for disposal one "Weir" boiler-feed pump and one "Kennedy" hot-water meter. (See our advertisement pages to-day.)

French Electrical Exhibition.—Arrangements are in hand for the holding of an electrical and radio exhibition in St. Etienne, France, from November 6th to 14th next, under the auspices of the Radio Club Forezien and the Chambre Syndicale de l'Electricité. Intending exhibitors can obtain particulars from the Place de l'Hotel de Ville, St. Etienne.

More Registractors.—At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors, the following applications for registration were accepted:—

Appleby & Miller, South Shields.
Cole Bros., Clapham, S.W.4.
Creemer, W. J., Cardiff.
Johnson & Tanner, Worcester Park, Surrey.
Lomax, F., Eccles.
Hugh Brown & Co., Glasgow.
Silcox, H., Bath.
Spray, E. C., Whitstable.
Hall & Stinson, Ltd., Sheffield.
Fenton, J. E., Dunfermline.
Co-operative Wholesale Society, Ltd., Trafford Park, Manchester.

At the same meeting one application was declined.

Unemployment.—There was a further small decrease in unemployment during the week ended September 27th, the number of registered unemployed at that date being 1,527,800, as compared with 1,530,884 on September 20th and 1,336,155 on September 28th, 1925.

Hastings Health Exhibition.—In connection with the annual congress of the Royal Sanitary Institute at Hastings next July, a Health Exhibition will be held in the town for a week. A preliminary prospectus received from the Institute indicates that the show will include domestic labour-saving appliances, smoke-preventing apparatus, heating, cooking, lighting, and ventilating equipment, &c.

New Metro-Vick Premises at Glasgow.—On Monday last week the new Glasgow premises of the Metropolitan-Vickers Electrical Co., Ltd., and Metro-Vick Supplies, Ltd., were formally opened in the presence of a large gathering of electrical people. As will be seen from the accompanying picture, the premises are of imposing appearance, and they are situated in Waterloo Street, in the heart of Glasgow's commercial quarter. One of the leading features of the building is a well-equipped showroom and there are commodious storerooms and offices. The interior decoration has been carried out in a very

The New "Metro-Vick" House, Glasgow.

thorough and artistic manner, especially in the showroom, where cedar panelling has been employed. Other sections of the premises are a large trade counter and a radio-apparatus repairing room. The building is lighted and heated throughout by electricity, and there is an ample hot water supply from an electric calorifier. The architect is Mr. J. T. Thomson, Glasgow.

The Timber Market.—Our Timber Trade Correspondent reports that the most pronounced feature of the wood market during the past month has been the appreciable rise in freight rates on timber from the north of Europe, due to the great demand for tonnage for the transport of coal to the United Kingdom. Consequently the spot market for all soft wood deals, battens, boards, and poles, &c., is firming up in sympathy, freight rates having advanced about 10s. a standard of 165 cubic feet. Stocks of the above-mentioned descriptions, on the whole, are moderate compared with the consumption, and would be small with a general revival of trade. Moreover, forward business is likely to be restricted on account of advanced freight rates, and shippers' attempts to force values up after bad results this season. In hardwoods generally the market is firm, as higher freight rates from the American Continent and other hardwood-producing centres have also increased owing to the keen demand for ship room. Besides this, shippers have high ideas of values for United Kingdom business, which also tends to restrict futures. Stocks generally are ample, but supplies of good-class mahogany are low.

Siemens Lamps at a New Zealand Show.—The Siemens and English Electric Lamp Co., Ltd., has sent us an illustration of a part of the stand of the British Manufacturers' Association at the Hawera Winter Show, New Zealand, held this year. This part of the stand was illuminated by Siemens "Silvalux" (opal) lamps, and one example of each type of Siemens lamps was displayed, including a traction lamp mounted on a stand which was subjected to blows from a 1¼-lb. hammer continuously throughout the ten days of the show.

Wages in the Contracting Industry.—According to a circular received from the National Federated Electrical Association, the rates of pay of men engaged in the electrical contracting industry remain unaltered until the period covered by the first pay day in January, 1927. The rates (per hour) are as follows:—Grade A, 1s. 10d. (including a travelling allowance); Grade B, 1s. 7¾d.; Grade C, 1s 6¼d.; Grade D, 1s. 5d.

Anglo-German Industrial Conference.—During last week-end a conference between British and German industrialists was held at the Romsey residence of Col. W. Ashley, the Minister of Transport, whose invitation was made purely in his private capacity. The British representatives included:—Sir Robert Horne, Sir Max Muspratt (president of the F.B.I.), Mr. Evan Williams (Mining Association), Sir Hugo Hirst, Sir Thos. Royden, Sir E. Manville, Col. Vernon Willey, Sir W. Larke, Sir A. Ross, Mr. H. Bond, Mr. F. C. Goodenough, and Mr. P. J. Hannon, M.P. The German party included Drs. Duisberg, Cuno, von Simson, and Kastl, and Herren von Weinberg, Reulsch, Sorge, Elster, Ephraim, and Wassermann. It is understood that among the matters discussed were:—Economic conditions in the two countries generally; the difficulties with which the various industries represented had to contend; the prospect of mutual assistance in re-establishing industries; the existing agreements for international co-operation; the reduced purchasing power of communities; and the disparity between the productive capacity of industrial nations. As a result of the conference a standing committee was formed, both nations being equally represented. Sir R. Horne was appointed chairman of the British side and Dr. Duisberg chairman of the German representatives. The hon. secretaries are Dr. Kastl, Mr. R. T. Nugent, and Mr. P. J. Hannon, M.P.

A Paisley Consumers' Booklet.—A useful booklet is being issued by the Paisley Corporation Electricity Department, containing very full details of the town's electrical service. On the inside of the front cover is a list of Paisley electrical contractors, and this is followed by a statement of supply pressures. A description of the generating plant then appears, followed by notes on distribution, accumulator charging, showrooms, &c. Then statistics of the undertaking and full details of the rates for supply are given, together with particulars of the appliance-hiring scheme, and other information.

Change of Address.—The British Electrical and Allied Industries Research Association is removing on October 30th to new offices at 36 and 38, Kingsway, W.C.2. Telephone: Holborn 0171.

All-Electric Home at West Hartlepool.—West Hartlepool claims (with justice we think) to have organised the first all-electric home in connection with the E.D.A.-E.L.M.A. national campaign. This was opened on the commencing day of the campaign, October 4th, by the chairman of the Electricity Committee (Alderman C. Macfarlane, J.P.), who was supported by Mr. J. H. Parker, the borough electrical engineer and tramway manager, and members of the Council. Alder-

An All-Electric House at West Hartlepool.

man Macfarlane outlined the national scheme and said that the house (which is illustrated in the accompanying figure) provided an admirable example of the advantages of electricity in the home. Mr. Parker said that a new showroom would be opened shortly. It was to be a showroom pure and simple; no sales would be made there, as there were plenty of contractors in the town ready to serve the public.

The International Glow Lamp Syndicate.—It is reported that representatives of the members of the International Glow Lamp Syndicate will hold a conference at the end of November, Paris being proposed as the place of meeting. The proceedings will be essentially a continuation of the conference which took place in Geneva last year. The question of international unification and standardisation of the manufacture of glow lamps will again form the central point of the discussions.

Book Notices.—*Faraday House Journal.* Vol. XII, No. 1. Michaelmas term, 1926. Published by the College.—The principal, Dr. A. Russell, deals with "The Individual Resistance of a Network" and also "The Maximum Possible Attraction between Equal Spherical Electrodes in Air." An article is contributed by Mr. H. H. Munro, on "Electrical Power Interconnection in France," while Mr. G. S. Buckingham discusses "The Supply of Electricity to Coal Mines." One of the numerous notes mentions the invention and construction by Mr. F. de Lautour of a 5-cycle internal-combustion engine, tests of which are declared to have proved it to be cheaper and more efficient than the engines used for motor cars.

"Dictionary of Wireless Technical Terms," compiled by S. O. Pearson, B.Sc., A.M.I.E.E.. Pp. 254, illustrated. London: Iliffe & Sons, Ltd. Price, post free, 2s. 3d.—This small volume of convenient pocket size is intended to serve as a guide, not only to the great army of experimenters and students who have not the advantage of a training in electrical engineering, but also to those who have been or are being trained as electrical engineers and are now studying "wireless." The dictionary contains ample definitions of all technical terms and expressions commonly encountered, and highly technical language has been avoided so far as is possible in the wording of definitions. An extended system of cross-references makes it possible for the book to be understood by those possessing the minimum of knowledge concerning wireless theory and practice. The book is well illustrated, and wherever necessary, an explanatory diagram has been added to a definition to enable it to be understood more easily.

"The Year Book and Diary of the Electrical Contractors' Association of Scotland, 1926-27." Edinburgh: Thos. Allan and Sons (for the Association). Price 3s. net, 3s. 6d. post free.—This contains very complete information regarding the membership and activities of the Association, as well as hints on contractors' accounting, Scottish contract regulations, reproductions of agreements, &c.

The South-East Lancashire Electricity Advisory Board has issued a brochure containing a report on Amendments to the Electricity (Supply) Bill, 1926, in which new clauses, and amendments to old clauses, are outlined.

"Aluminium Foundry Work." Pp. vi+91. London: British Aluminium Co., Ltd.

"Junior Technical Electricity," by R. W. Hutchinson. Second edition. Pp. viii+385; figs. 327. London: University Tutorial Press, Ltd. Price 4s. 6d.

"Electric Lighting and Power Distribution," by W. Perren Maycock. Vol. I, Ninth Edition, revised by C. H. Yeaman. Pp. xiii + 562; figs. 388. London: Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d. net.

The Ulster Wireless Exhibition.—We have received from Messrs. Alfred Graham & Co. a photograph (reproduced herewith) of a part of the stand of the General Electric Co., Ltd., at the Ulster Wireless Exhibition held recently at Belfast.

G.E.C. Stand at the Ulster Wireless Exhibition.

Messrs. Graham's "Amplion" loud speakers were given special prominence in this exhibit, which also included "Gecophone" radio products and "Osram" valves.

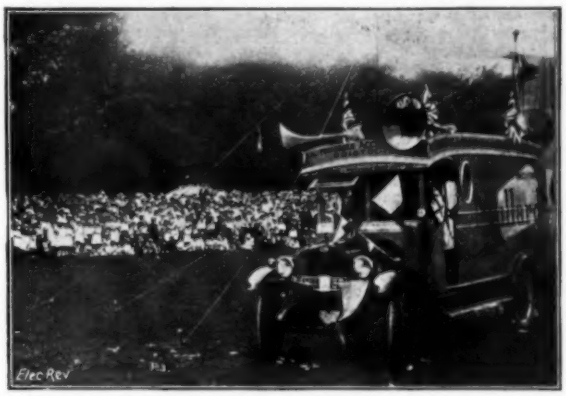
Serious Australian Fire.—The *Financial Times* reports that damage estimated at over £125,000 was caused by a fire at the premises of the Australian General Electric Co., Sydney, on October 11th. Other reports put the amount of the damage at a higher figure.

Contractors' Visits to "Osram" Works.—A party of 70 members of the South Wales and West of England branch of the Electrical Contractors' Association, accompanied by the president, Mr. H. J. Miles, and the secretary, Mr. L. C. Penwill, paid a visit to the Osram Lamp Works recently. At a luncheon presided over by Mr. F. P. Driver, of the General Electric Co., Ltd., mention was made of the E.D.A.-E.L.M.A. campaign, and Mr. Miles recommended it to the members of the Association, being supported in this by Mr. T. E. Alger and Mr. W. E. Bush.

On September 23rd, another party of contractors visited the Osram Lamp Works and the showrooms at Magnet House, Kingsway, W.C.2. These were members of the Sheffield Branch of the E.C.A.

Radio Transformer Price Reduction.—RADIO INSTRUMENTS, LTD., informs us that it has reduced the price of the "R.I." multi-ratio transformer. We have had a sample of this instrument in use for some time, and have found the large range of ratios available very convenient, whilst the reproduction (on a "Celestion" loud-speaker) is excellent.

A Radio Touring Van.—We made reference a short time ago to a specially-equipped motor van which was to tour certain parts of the country to advertise "Mullard" radio valves, "Amplion" loud speakers, and the products of Automobile Accessories (Bristol), Ltd. This van has recently been travelling in the West of England, and in the course of its journeyings gave demonstrations at no fewer than 32 carnivals, fêtes, and galas. Our picture shows the van amusing a large, mainly juvenile, audience at the Poole Carnival. Last week the van made a tour of North Wales.



A Radio Demonstration Van.

Trade Announcements.—The address of the *British Engineers' Export Journal*, the overseas organ of the British Engineers' Association is now:—Rooms Nos. 244-251, Bank Chambers, 329, High Holborn, W.C.2. Telephone: Holborn 0156 (three lines).

MESSRS. WALKER, CROSWELLER & CO., of 54-58, Queen Elizabeth Street, London, S.E.1, have been appointed sole British representatives of Lewis M. Ellison, of Chicago, U.S.A., manufacturer of inclined draft gauges.

The ROBINSON & HANDS ELECTRICAL CO., LTD., has opened new branch premises at Glebe Street, Stoke-on-Trent.

To deal more effectively with business in the London and district area, MESSRS. NEWTON BROTHERS (DERBY), LTD., have opened offices at 56, Kingsway, London, W.C.2. Telephone: Holborn 0531 (London district manager, Mr. F. V. Pipe).

The head office, show rooms, &c., of ELECTRIC ART SHADES are now at Feering Factory, Kelvedon, Essex. Telephone: Kelvedon 63.

THE LICHFIELD AGRICULTURAL CO., Market Street, Lichfield, has opened new showroom premises for its electrical department.

MESSRS. A. & B. FORREST have removed from Cartvale Road to 431-433, Shields Road, Glasgow, S1. They ask for electrical catalogues.

Catalogues and Lists.—THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Two posters in colours advertising "Sterling" headphones and "Marconi" valves.

ERICSSON TELEPHONES, LTD., International Buildings, 67-73, Kingsway, W.C.2.—A beautifully-coloured showcard advertising the company's radio receiving sets and accessories.

MESSRS. ALBERT C. HANDS & SONS, 57, Shoe Lane, Charterhouse Street, E.C.4.—A fully-illustrated catalogue of electric lighting fittings and accessories, including electroliers, brackets, lanterns, statuettes, signs, &c. It also includes particulars of domestic appliances. Priced.

HOPKINSON INDUCTION MOTORS, Willesden Lane, North Acton, W.3.—October stock list of single- and three-phase motors.

THE IRON & NICKEL BATTERY CO., LTD., 17-19, Cockspur Street, S.W.1.—October blotter, advertising "Ionic" accumulator batteries.

MESSRS. MAVOR & COULSON, LTD., Glasgow.—October blotter, advertising the company's coal-cutting machines.

THE WELSBACH LIGHT CO., LTD., 344-354, Gray's Inn Road, W.C.1.—Catalogue No. 511, containing illustrated particulars and prices of electric lighting fittings, including wiring accessories, domestic appliances, service switchgear, lamps, &c.

THE SUN ELECTRICAL CO., LTD., 118 and 120, Charing Cross Road, W.C.2.—An illustrated and priced catalogue of electric fires of many makes, and a list of reduced radio valve prices.

THE LONDON ELECTRIC FIRM, Brighton Road, Croydon.—A series of pamphlets dealing with lamp-lowering gear, flexible couplings, worm reduction gear, carbons, searchlights, winches and other products of the company and its associate the Electric Heating Co.

MR. THOS. VICKERS, 14, New Street, Birmingham.—An illustrated and priced pamphlet advertising steel barrows of various types.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—October blotter, advertising "Jackson" electric fires.

Messrs. Adam Hilger, Ltd., 24, Rochester Place, Camden Road, N.W.1.—Two well-illustrated booklets dealing respectively with spectrographs and wave-length spectrometers.

Wagner Electric Supplies, Ltd., 66, Victoria Street, S.W.1.—Stock List No. 22E, containing particulars and prices of d.c. and a.c. motors and starters.

Messrs. Fry & Co., Ltd., Maskell Street Works, Rusholme Road, Manchester.—An "extras list" of round h.c. cotton and silk-covered soft copper wires.

The D.P. Battery Co., Ltd., Bakewell, Derbyshire.—Two descriptive price lists dealing respectively with high- and low-tension radio accumulator batteries.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—A well-produced catalogue, illustrated in colour, of "Silverstone" lighting glassware—bowls and shades. Priced.

Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, E.C.4.—A pamphlet (No. 215), containing details and prices of Association valves; Leaflet No. Z.102, dealing with "Siemens" bridge type fuseboards; and Leaflet No. Z.111, advertising the "Ideal" switch and fuses. Also an October price list of electrical appliances and accessories.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—The "Osram Lamp Booklet," describing the nature and manufacture of electric lamps for the information of the user.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—October stock list of dynamos and motors.

The Ever-Ready Co. (Gt. Britain), Ltd., Hercules Place, Holloway, N.7.—A fully-illustrated and priced catalogue of dry batteries and accumulators for lighting and radio purposes. The company also undertakes to supply any type of valve for use with its batteries.

The Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, E.15.—A coloured poster (29 in. by 20 in.), advertising "Hart" batteries for motor starting and lighting.

The Century Electric Co., 1806, Pine Street, St. Louis, Mo., U.S.A.—An illustrated folder advertising "Century" single-phase repulsion-start motors.

Messrs. Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.—Catalogue P1124, dealing with electric lighting standards (floor and table), and shades; and a catalogue, No. P1134, advertising shop window lighting equipment. Fully illustrated and priced.

Messrs. Wm. Sanders & Co., Falcon Electrical Works, Wednesbury.—A priced leaflet advertising hard-drawn copper tube cable sockets.

Messrs. Ransomes, Sims & Jefferies, Ltd., Orwell Works, Ipswich.—A well-illustrated brochure describing in detail the company's electric trolley 'buses, with special reference to their substitution for existing tramways.

Bankruptcy Proceedings.—F. Somerfield, 85, Lichfield Road, New Invention, near Wolverhampton, electrical and mechanical engineer and contractor.—The public examination of this debtor was held on October 6th at the County Court, Wolverhampton. The gross liabilities were returned at £129. Debtor attributed his failure to keen competition and depression in trade. He stated that the coal dispute was practically the cause of his financial trouble. He went to Bloxwich in 1921 and later removed to New Invention, where he opened premises. The examination was adjourned to be closed.

S. Parkes, trading as H. & S. Parkes, Wistaston Road, Crewe, electric battery manufacturer.—The public examination of this debtor was held on October 7th at the Court House, Crewe. The statement of affairs showed ranking liabilities of £434, against assets estimated at £16, leaving a deficiency of £418. Debtor attributed his failure to lack of capital, &c. It appeared that he commenced business two years ago as a knitwear manufacturer. In October, 1925, he entered into a verbal agreement with another to carry on business in partnership as manufacturers of electric batteries, and he paid about £60 in preliminary expenses. In December, 1925, they obtained on credit 450 transmission poles, invoiced at £90, and these were sold a few days later for £33 15s. In June judgment was given against him for the cost of the poles, and in consequence thereof and pressure by other creditors he filed his petition. The examination was adjourned for the production of a wages book and to enable the Official Receiver to make further inquiries respecting the sale of the poles.

P. F. Brittain (trading as Brittain's Electric Motor Co.), electrical engineer, Dermody Road, Lewisham, 110, Cannon Street, E.C., and Folkestone.—The adjourned first meeting of creditors was held on October 8th, before Mr. F. Vyvyan, Assistant Official Receiver, at the London Bankruptcy Court. The debtor presented his petition on September 1st, roughly estimating his liabilities at between £2,000 and £3,000, and valuing his assets at £17,000. The chairman reported that the meeting had stood adjourned to enable the debtor to arrange to provide a fund out of which to pay his debts in full. Mr. S. S. Moore, for the debtor, stated that there had been a delay owing to the holidays. The scheme in prospect was to form a limited company with a capital of £25,000 to take over the business, and already sufficient promises had been received to guarantee payment in full of all liabilities. In those circumstances he asked for a further adjournment of a month. The business would be carried on in the meantime by Mr. J. Hodson, the special manager, so that the interest of the creditors would not be prejudiced in any way. Mr. Hodson said that he was strongly of opinion that the business should be sold as a going concern. The creditors generally opposed any further adjournment of the meeting, and passed a resolution for the estate to be administered in bankruptcy by Mr. Hodson and Mr. Osborne acting as joint trustees, with the assistance of the following committee of inspection, *viz.*: Mr. Hitchcock (Premier Electric Control), Mr. Stokes (Robinson & Son), and Mr. Drewett (Sankey and Sons, Ltd.). The chairman said that he would apply to the Court in due course for an order of adjudication; it would be open to the debtor then to submit an offer, and, if approved, the Registrar would doubtless postpone making the adjudication to allow an opportunity for the debtor to carry through a proposal and get the receiving order rescinded.

G. Mason and G. E. Tinsley, trading as Mason & Tinsley, 6, Alberta Terrace, Sherwood Rise, Nottingham, electrical engineers.—The public examination of these debtors was held on October 7th, at the County Court House, Nottingham. The gross liabilities were given as £354, with a deficiency of £321. Debtors attributed their failure to trade profits being insufficient to meet drawings from the business. It appeared that Mason took Tinsley into partnership in September, 1924. No accounts were prepared and the interests were equal. Their drawings had exceeded the profits made. The examination was closed.

James V. Figgins, trading as Victor Figgins, 97, Fore Street, St. Mary Church, Torquay, plumber and sanitary and electrical engineer.—The public examination of this debtor was to be held on October 7th at the Castle, Exeter, but the debtor failed to appear and the examination was accordingly adjourned.

S. L. Bapty and N. Miles (Wireless Instrument Manufacturing Co.), wireless instrument manufacturers, Avenue Works, Avenue Road, Willesden Junction, N.W.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., released September 15th.

J. A. Trend, electrician, 31, Chapel Street, Luton.—Last day for proofs for dividend, October 19th. Trustee, Mr. T. Keens, 11, George Street West, Luton.

H. L. Smith, electrician, 156, Tredegar Road, and 10, Ordell Road, Bow, E.—Receiving order made September 30th, on debtor's own petition. First meeting held October 14th; public examination, November 30th, at Carey Street, W.C.

G. Boyd, electrical engineer, New Road, Mouse Hill, Millford, Surrey.—First meeting held October 13th, at 29, Russell Square, W.C.; public examination November 2nd, at the Guild Hall, Guildford.

H. Milnes (H. Milnes & Son), plumber and electrical engineer, 6, Trinity Street, Huddersfield.—Trustee, Mr. A. Pontefract, 6, New Street, Huddersfield, appointed September 30th.

Private Arrangements.—W. L. Gray, 9, Victoria Parade, Muswell Hill, electrical and radio engineer.—A meeting of creditors was held on October 7th at the offices of Messrs. Corfield & Cripwell, Finsbury Pavement, E.C., when Mr. W. A. J. Osborne presented a statement of affairs which showed liabilities of £2,571, of which £2,426 was due to the trade, while there was a cash creditor for £160, who held as security a life policy which was valued at £15, leaving £145 to rank as unsecured. The assets totalled £1,422, from which had to be deducted preferential claims totalling £83, leaving net assets of £1,339, or a deficiency of £1,231. Mr. Osborne said that the holder of the life policy had withdrawn her claim. A meeting of the creditors was held last year, and a committee of inspection consisting of five of the creditors was formed. The committee received from the debtor from time to time certain figures with regard to the condition of the business. A composition scheme was also primarily agreed to, but was not carried into effect with the exception of the payment by the debtor of a dividend of 1s. in the £. The committee recently came to the conclusion that it was impossible to continue the business with any hope of carrying through the original suggestion. As there were creditors with actions pending it was decided that the estate should be dealt with under a deed of assignment, and Mr. Osborne was appointed trustee. The creditors discussed the position, and as Mr. Osborne said it was likely an offer would be made for the business at an early date it was decided that the deed of assignment already executed in favour of Mr. Osborne should be confirmed, and that the original committee should be re-appointed to act with the trustee. The following are creditors:—

	£		£
British Thomson-Houston Co., Ltd.	77	Edison Swan Electric Co., Ltd.	55
Brown, S. G., Ltd.	175	Fuller's United Electric Works...	27
Bentley, E. L.	33	Graham, A., & Co.	88
Burndept, Ltd.	173	General Electric Co., Ltd. ...	108
Chloride Electrical Storage Co., Ltd.	242	Greenslade & Brown	22
Castellina Co., Ltd.	26	Igranic Electric Co., Ltd. ...	147
Dubilier Condenser Co. (1925), Ltd.	102	Marconiphone Co., Ltd.	384
Ever-Ready Co. (Great Britain), Ltd.	130	Radio Communication Co., Ltd.	34
		Robinson, L., & Co.	127
		Watshams, Ltd.	69
		Marks, Ward & Co., Ltd. ...	90

Company Liquidations.—Elba, Ltd., 1, Winchester Place, Acton, Middlesex, battery manufacturers.—The winding up order in this matter was made on a creditor's petition. The statement of affairs shows liabilities of £3,274, while the assets are estimated at £354, from which preferential claims of £67 have to be deducted, leaving an amount of £287, which is insufficient by £1,033 to meet the claim of a debenture holder amounting to £1,320. The issued share capital of the company amounts to £1,353, so that there is a deficiency as regards the contributories of £4,627. The failure of the company is attributed to insufficient working capital, delay in receiving the final instalment of the amount advanced by the debenture

holder, keen competition, and bad trade. The deficiency account shows a gross profit of £916 from carrying on the business from the date of the formation of the company to the date of appointment of a receiver for the debenture holder, but there was a net loss. The company was registered as a private company on January 29th, 1924, for the purpose of manufacturing batteries for electrical and radio purposes. The nominal capital was originally £2,000, divided into 2,000 shares of £1 each. On October 27th, 1924, a resolution was passed increasing the capital of the company to £2,100 by the creation of 4,000 deferred shares of 6d. each, which were allotted and paid for in cash. The business acquired by the company was originally commenced at Farringdon Road, E.C., and in May, 1921, was transferred to a limited company. On January 1st, 1923, the business was removed to Acton, and shortly afterwards a debenture holder for £1,350 appointed a receiver who carried on the business until January 29th, 1924. Apparently the receiver sold all the assets of the company (except the book debts) subject to a charge to the bank for about £800, to Elba, Ltd., then formed to take it over, for £1,250, which was satisfied by the allotment to the debenture holder of 1,200 fully paid £1 shares in the new company. It is now stated, however, that in order to preserve the credit and goodwill of the business, the present company found it necessary to make a number of payments to the creditors of the first company, and that the payment off of the bank and the payments to these creditors make up the sum of £1,379 shown in the deficiency account as part of the company's losses. The company had the usual borrowing powers, and on December 5th, 1924, £1,320 was borrowed at 10 per cent. per annum upon debentures covering all the assets of the company. The following are creditors:—

	£		£
A.E.F. Manufacturing Co. ...	25	Henrion Carbons, Ltd. ...	35
Berry, A.	20	Herve, Ltd.	20
Blackstaff Flax Spinning Co.	20	Metropolitan Electric Supply Co.	30
Building Products, Ltd. ...	1,015	Oldham & Sons, Ltd.	40
Buck & Hickman	135	Pa'e & Thomas	20
Chapman, J.	80	Rhys,Spencer & Co.	35
D.P. Battery Co., Ltd. ...	35	Rolax, Ltd.	20
English, R.	20	Tringham, E. M.	110
General Celluloid Co.	40	Tallent & Co.	50
Hill Jones, Ltd.	55		

PRESSLAND ELECTRIC SUPPLIES, LTD., wholesale wireless factors, late Kingston-on-Thames.—Mr. W. Bronson, I.A., 157, Cricklade Avenue, Streatham Hill, S.W., the liquidator in the voluntary liquidation of this company, has issued a circular to the creditors in which he states that there will be nothing at all for unsecured creditors; the debenture holder will not be fully satisfied. In an accompanying report Mr. Bronson states that prior to December, 1922, Mr. C. Pressland, who was an electrician, inventor and patentee, was in business on his own account. The company was formed as a private limited liability concern, on December 9th, 1922, with a nominal capital of £1,100, all of which was issued. Mr. A. W. Matton subscribed £1,000 for shares, and 100 shares were issued to Mr. Pressland, of which 98 were for a consideration other than cash. Subsequently the company required further capital and Mr. Matton found £2,500 without security. When Mr. Matton required security, debentures were issued over the assets. The trading figures showed that up to June 30th, 1925, the net purchases of the company were £54,239, against net sales of £58,526.

C. E. FALCONBRIDGE, LTD., electrical and radio engineers, Nottingham.—A meeting of creditors was held recently at Nottingham. The chair was occupied by Mr. S. H. Hill, who reported that the company had passed resolutions for voluntary liquidation, and had appointed him to act as liquidator. He said that the liabilities were £1,697, of which £951 was due to the trade and £746 to the bank. The assets were estimated to realise £672, from which had to be deducted £105 for preferential claims, leaving net assets of £568, or a deficiency, so far as the creditors were concerned, of £1,129. The liquidator said that there was a large amount of cash in hand due to the fact that a portion of the stock and fixtures at the shop had been disposed of. The company was registered in November, 1917, and took over a business which had previously been carried on by Mr. Falconbridge. The purchase price was £578, which was satisfied by the allotment of shares to that amount to the vendor. For a number of years the company carried on business successfully, but during the period ended February last a loss of £1,087 was sustained on the trading. About £800 of that loss was occasioned by a shop at Stoke, which was opened in April, 1925, and eventually closed down. The stock had to be sold at low prices. The issued capital of the company was £1,328, and the shares, apart from those issued to the vendor, were allotted for cash. Liquidation took place owing to pressure by creditors. A resolution was passed confirming the voluntary liquidation of the company, with Mr. Hill as liquidator, whilst an advisory committee was appointed consisting of the representatives of the bank and of Messrs. Pearson Bros., and C. A. Vandervell and Co., Ltd.

WOODSTOCK ELECTRIC LIGHT CO., LTD.—Winding up voluntarily. Liquidator, Mr. V. N. Tolley, Woodstock.

WOLVERHAMPTON & STONY STRATFORD DISTRICT NEW TRAMWAY CO., LTD.—A meeting of members is called for November 13th, at 24, Mill Street, Bedford, to hear an account of the winding up from the liquidator, Mr. G. H. Margrave.

Dissolution of Partnership.—CENTRAL LIGHT AND POWER Co., electrical engineers, Friars Lane, and Southgate Street, Leicester.—Mr. J. Orton and Mr. T. Wright have dissolved partnership.

Deed of Assignment.—J. M. JAMIESON, electrical engineer, 3, The Arcade, Richmond.—Particulars of claims by October 22nd, to the trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

The Electrical Trade of China.—The annual report of the Statistical Secretary of the Chinese Inspectorate-General of Customs, lately issued, states that power supply companies in the interior were hampered by military exactions last year, so that not only were they unable to extend their activities, and much less install new plant, but it was all they could do to manage to hold their own under adverse circumstances. Furthermore, certain proposed extensions, as the one at Amoy, had to be abandoned on account of the anti-British boycott. Nevertheless, orders were placed for the extension of electrical plant at Chungking and Pootung, and at Harbin for the Harbin tramways, and a British company obtained a contract for a small plant in a town near Changsha. A combine was formed during the year to regulate the price of electric lamps, thereby putting a stop to the ruinous policy of underselling in order to conquer the market, and as a result prices of lamps advanced. The local manufacture of electric fans proved a serious danger to foreign importers; so much so that American importers were obliged to reduce their prices by 15 per cent. in order to meet the situation and maintain their place in the market.

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, October 12th:—Copper (electrolytic) bars, £66 5s., 10s. dec.; ditto ditto sheets, and wire rods, no change; ditto ditto h.c. wire, 9 11/16d., 1/16d. inc.

Messrs. James & Shakespeare report, October 12th:—No change in the prices of copper bars (best selected), sheet and rod; English pig lead, £31 15s., 15s. dec.

Messrs. Edward Till & Co. report, October 12th:—India rubber (Para, fine), 1s. 8¼d., ¼d. dec.

Lighting and Power Notes.

Abergele.—INAUGURATION OF SUPPLY.—An electricity supply for the district was formally inaugurated on October 2nd. The supply is obtained from the Electricity Distribution of North Wales and District, Ltd.

Australia.—VICTORIA.—According to the *Industrial Australian and Mining Standard*, rapid progress is being made by the Victorian State Electricity Commission with the extension of its undertaking in the north and north-eastern portion of the State. The transmission line which will connect Echuca and neighbouring towns to the Yallourn power house through the metropolitan transmission line to Yallourn and the north-eastern transmission line from Thomastown has been completed. Arrangements for supplying electricity in Springhurst are also well advanced. The supply from Yallourn to the north-eastern district through Thomastown now exceeds 1,000 kW. According to a statement issued by the Electricity Commission, the output from Yallourn and Newport is now 750,000 kWh per day, while the maximum daily load is 45,000 kW. It is anticipated that every month will now show an increased load, and the Commission considers that as the maximum capacity of the existing stations is 70,000 kW, consideration should be given to future extensions. In the middle of May the average actual output from Yarraville station was approximately 600,000 kWh per day; by June it had risen to 640,000 kWh. In July the average was 660,000, and at the beginning of August the figure had risen to 690,000.

Barnstaple.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £1,450 for mains and services, £1,000 for public lighting mains, and £300 for meters.

Bath.—LOAN SANCTIONED.—The City Council has received sanction to a loan of £34,000 in respect of a scheme for supplying electricity in West Wilts., Bathford, Oldfield Park, and other districts.

Birkenhead.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £40,000 for mains and feeders.

Brazil.—SAO PAULO.—Following upon the emergency measures taken by the Government of Sao Paulo to overcome the shortage of electrical energy, contracts have been signed for the immediate construction of an additional power station by the Sao Paulo Light and Power Co. It has been decided to erect a hydro-electric plant at the base of the Serra, near Cubatao, to utilise a waterfall at a point near the Rio Pedras. The plant will consist of two units of 40,000 h.p. each.—*Reuter's Trade Service* (Sao Paulo).

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—According to the Canadian *Electrical News*, within the next two years the West Kootenay Power and Light Co. will expend approximately $3,000,000 in developing 60,000 h.p. from the Lower Bonnington Falls. The site is one mile down the Kootenay River from the company's present power site, and work will start in the near future. As soon as water level permits, the construction of the cofferdam will commence. The company has in view the development of 30,000 additional h.p. at a later date. The present hydro-electric development at Bonnington Falls amounts to 100,000 h.p.

Chesterfield.—Electrical Development.—The borough electrical engineer (Mr. D. H. Davies) informs us that the Town Council has received sanction to the borrowing of £19,334 for mains and provision of a sub-station. Such rapid progress has been made that it has been decided to apply for the sanction to the borrowing of a further £12,848 for further mains extensions and £6,000 for the wiring of a further 800 houses under the hire-purchase wiring scheme. The number of houses wired under this scheme during the past two years exceeds 1,200.

Continental.—Denmark.—There are 479 public power stations in Denmark. According to *Commerce Reports*, the total net production during 1924-25 was approximately 251,000,000 kWh, which was an increase of about 12 per cent. over the 1923-24 total. In addition to these there are 518 private stations.

France.—The report of the Société de l'Union d'Electricité, of Paris, for the last financial year shows that the company's output totalled 672,073,080 kWh, an increase of 74 million kWh as compared with 1924. The power station at Gennevilliers is being enlarged to accommodate two new 50,000-kW turbo-generator sets, one of which is already undergoing tests. Three new 60,000-V transformer stations are being established by the company in the Paris district—at St. Ouen, Arceuil, and Courbevoie. The 60,000-V mains now extend to a length of nearly 140 miles.

Spain.—The Sociedad Co-operative Electrica de Langreo has recently placed an order with the Brown, Boveri Co., of Baden, Switzerland, for a 12,000-kVA steam turbo-generator which will double the capacity of its power station at La Felguera, in the province of Asturias. The company is to install pulverised fuel plant for three of its boilers at that station. If the experiment proves successful it is intended later to adapt all the boilers to pulverised fuel firing.

Dufftown (Banff.).—Electricity Scheme.—The Town Council has issued a statement to the ratepayers regarding the proposed electric lighting scheme. The initial cost of the scheme is estimated at £5,500.

Eastbourne.—Loan.—The Electricity Committee is applying for sanction to the borrowing of £20,000 for electricity extensions.

Electricity in Bulk.—The Committee is considering an application from the Weald Electric Supply Co., Ltd., for a supply of electricity in bulk.

Glasgow.—Progress during August.—During August, 89 houses were wired under the Corporation Electricity Department scheme, making the total to date 2,554. The number of applications for hire of domestic appliances was 206, making a total of 10,789.

Ilford.—Loans Sanctioned.—The Electricity Committee has received sanction to the following loans:—£20,000 for mains and services; £4,500 for connecting plant at Upwel Road sub-station; £5,820 for sub-station equipment and transformer kiosks; and £6,842 for the erection and equipment of Gauls Hill sub-station.

Increased Charges.—Owing to the higher cost of coal, increases in the charges for electricity have been made or recommended in the following districts:—

Ilford, Leyton and Walthamstow.—An increase of 10 per cent.

Barnstaple, Hebden Bridge, and Accrington.—An increase of ¼d. per kWh.

Isle of Wight.—*Isle of Wight Electric Light and Power Co., Ltd.*—Power and heating: An increase of ¼d. per kWh.

Luton.—The percentage increase raised from 10 to 25 per cent.

Bath.—Power: An increase of 10 per cent.

Blackburn.—Lighting and heating: An increase of 10 per cent.

Salisbury.—Lighting: First 100 kWh per quarter, 8d. per kWh; next 100 kWh, 7½d.; beyond, 7d. per kWh. Power and heating: First 3,000 kWh per quarter, 4½d. per kWh; beyond, 3d. per kWh.

Surbiton.—*Callender's Cable and Construction Co., Ltd.*—Power and heating: An increase of ¼d. per kWh.

York and Hendon.—An increase of ¼d. per kWh.

Irish Free State.—Dublin.—The City Commissioners are applying for sanction to a loan of £475,150 for extensions to the electricity undertaking. The loan is made up as follows:—Extension of power station, £135,000; provision for Shannon scheme, £104,000 (this expenditure will only be necessary if and when arrangements are made for a bulk supply from the Shannon scheme); trunk feeders and part cost of the Liffey tunnel, £44,500; extension of distribution system, £68,450; extension of sub-stations and strengthening distributing system, &c., £56,800; services, meters, &c., £36,000; housing scheme, £7,600; sales department, £22,000.

Japan. — Electrical Development. — *Commerce Reports* states that the construction of the 30,000-kW sub-station of the Toho Electric Power Co., at Nishi Biwajima, a suburb of Nagoya, is proceeding rapidly. There will be four transformers, each of 7,500-kW capacity. Part of the machinery has already been installed and the plant will be completed before 1927. This station will receive power supplied by the Daido, Ibi, Nagaragawa, and Nohi Electric Power Companies, and by the Hayakawa Water Power Co., for distribution to other sub-stations in the city.

Leeds.—Loans.—The Electricity Committee is considering the question of applying for sanction to loans of £400,000 for mains and £95,000 for services.

London.—St. Marylebone.—The accounts of the Borough Council's electricity undertaking (engineer: Mr. C. H. Smyth) for the year ended March 31st last show a total income of £428,705, as compared with £435,628 in the preceding year. Working expenses increased from £220,999 to £225,940, leaving a net surplus of £202,764 (£214,630), to which was added bank interest of £1,139, and other small items, making a total of £215,850 available. Capital charges absorbed £173,700, and there was a net profit of £29,344, as compared with £49,614 in the previous year. The capital expenditure during the year amounted to £100,022, the chief items being £40,736 for machinery and £17,665 for mains and services. The electrical energy sold increased from 50,667,433 to 58,400,899 kWh, and the maximum supply demanded from 28,003 to 34,000 kW. The average price obtained per kWh fell from 1.945d. to 1.651d.

Maidstone. — New Electricity Charges. — The Town Council has fixed the following tariff for houses using electricity regularly for lighting, heating, cooking, and continuous hot-water supply, on the telephone system:—A charge of 8s. per annum for each 30-watt lamp or its equivalent, and ¾d. per kWh during the winter quarters, and ½d. per kWh during the summer quarters. A stand-by supply of 750 kW is to be given to the Holborough Cement Co., to be available in the case of a breakdown of the supply to the company from the County of London Electric Supply Co. on the following terms:—The company to pay £100 on each occasion when the supply is used, plus 1d. per kWh for electricity consumed.

Manchester.—Progress during July and August.—During the months of July and August the Corporation electricity undertaking showed an increase in connections of 2,651 kW, bringing the total to 289,826 kW; and the number of applications received for supply, including consumers for additional supplies, was 1,702, representing a total of 4,926 kW. The number of hired cookers connected increased by 224, bringing the total actually on circuit to 2,081. Applications for the hire of cookers totalled 243. A new sub-station equipped with two 125-kVA transformers was put into commission during July, and a 50-kVA transformer was replaced by one of 250-kVA at Ryecroft Hall sub-station in August.

New Zealand.—Arapuni Hydro-Electric Development.—According to the *Electrical Engineer of Australia and New Zealand*, steady progress is being made with the construction works in connection with the Arapuni hydro-electric development. Excavations at the site are nearly complete, and the three 12-ft. penstock tunnels from the power station up through the cliff to the forebay have been pierced. In addition a 9-ft. tunnel has been driven connecting the power station with the switchyard. This will carry the power and control cables. A commencement has been made with the construction of the spillway weir across the old river bed above the power station. This will be of concrete, 35 ft. high and 257 ft. long, with a 485-ft. extension. The preparation of the old river bed to act as the headrace is nearly complete.

Northern Ireland.—Ballycastle (Co. Antrim).—At a recent meeting of the Urban District Council a report was received from the Lighting Committee stating that it had considered letters from the D.S. Electrical Co. and the Electricity Commissioners relative to the Council's position with regard to town lighting. The Committee recommended that application be made to the Commissioners for a Special Order authorising the Council to supply electricity for lighting; and that an engineer be appointed to prepare and submit a suitable scheme. It was also recommended that notice be served on the D.S. Electrical Co. to remove all street standards, cables, &c., from streets within one month from October 31st The report was adopted.

Padiham.—Plant Extensions.—The Electricity Commissioners have given permission to the Lancashire Electric Power Co. to double its existing generating plant at Padiham power station.

Seaton.—Electricity Scheme.—The local Council has received from the Rural District Council's surveyor estimates for three electricity schemes for the district. For a scheme with underground mains the estimated cost is £6,463. The other two schemes are for overhead lines, the respective estimates being £5,644 and £3,992. The scheme recommended is that estimated to cost £5,644. It is proposed to purchase electricity in bulk from a local colliery at 1d. per kWh, and sell it at 5d. per kWh. The Council is to consider the matter at a special meeting.

Sheffield.—Electricity Supply Extensions.—The Electric Supply Committee has approved extensions and works at an estimated cost of £9,606, and extensions of mains for general distribution purposes at an estimated outlay of £28,828. The Commissioners have sanctioned the borrowing of £4,591 for the erection of sub-stations in the city.

South-East Lancashire Electricity Advisory Board.—Manchester.—The Engineering Advisory Committee has been notified that the Electricity Commissioners have sanctioned the installation of one 40,000-kW turbo-alternator by Manchester Corporation at its Barton power station.

Ashton-under-Lyne.—The Commissioners have also sanctioned the installation of one 6,000-kW turbo-alternator at the Corporation's electricity works.

Leigh.—The Committee has received a communication from the Lancashire Electric Power Co. regarding a supply of electricity to the Leigh Corporation, and has decided that the company's proposals are satisfactory.

Electricity Orders.—The Board has been recommended to support the application of the Lancashire Electric Power Co. for a Special Order to supply electricity in the rural district of Leigh, and applications for Fringe Orders by the Cheadle and Gatley U.D.C. to supply in Northern Etchells, and Altrincham Electricity Supply, Ltd., in Ringway.

New Station at Kearsley.—The Lancashire Electric Power Co. has notified the Committee of its intention to apply for consent to erect a new generating station at Kearsley. The station will be designed for four 31,250-kW sets, only two being installed at first. The boiler house will be designed to accommodate sixteen 75,000-lb. boilers. The cost of the initial installation will be £875,543, and of the completed station £1,644,930. The Committee has adjourned consideration of the matter, and investigations are to be made of the requirements of the district, together with the location of the load during the next five years, with a view to ascertaining whether the requirements can be met by the existing stations in the district.

The minutes of the proceedings of the Engineering Advisory Committee have been approved by the Board.

South Shields.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer: Mr. J. Edgar) for the year ended March 31st last, shows a total income of £87,192, and working expenditure of £46,166, leaving a gross surplus of £41,026. The previous year's figures were:—Income, £85,956; working expenses, £48,449; gross surplus, £37,507. Interest and sinking fund charges accounted for £24,014, and works of a capital nature charged to revenue amounted to £8,613, leaving a net surplus of £8,398, as compared with £9,191 in the preceding year. The capital expenditure during the year amounted to £184,588, and included £46,112 for machinery, £64,279 for mains, and £37,866 for the assisted-wiring scheme. Local trade depression resulted in a falling-off in the consumption of electricity for power purposes, with the result that the total sales decreased from 8,532,412 to 8,513,818 kWh. Under the assisted-wiring scheme 7,105 additional consumers were connected to the system during the year.

Special Orders.—The Shropshire, Worcestershire and Staffordshire Electric Power Co. has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in the borough of Ludlow.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising Cheltenham Corporation to supply electricity within parts of the rural districts of Cheltenham, Tewkesbury, and Winchcomb, and the Truro Electricity Supply Co., Ltd., in the city of Truro.

Walton-on-Thames.—Purchase of Undertaking.—At a recent meeting of the Urban District Council it was decided to offer £89,000 to the Urban Electric Supply Co., Ltd., for the purchase of its electricity undertaking in the district.

Warrington. — Year's Working. — The report of the borough electrical engineer (Mr. F. V. L. Mathias) on the working of the Corporation electricity undertaking for the year ended March 31st last records a total income of £115,102, as compared with £108,499 in the preceding year. Working expenses amounted to £70,919, as against £68,709, leaving a gross profit of £44,183 (£39,790), to which was added interest on investments of £1,205, making a total of £45,388 available. After deducting capital charges a net surplus of £10,319 remained, as compared with £8,294 in 1924-25. A contribution of £4,000 was made to the borough fund. The amount spent on capital account during the year was £35,025, and included £26,117 for mains and services. The electrical energy sold increased from 16,302,154 to 17,179,291 kWh, and the maximum supply demanded from 7,300 to 7,796 kW.

Tramway and Railway Notes.

Birkenhead.—Track Renewals.—The Tramways Committee has decided to reconstruct the tramway track in Park Road North, at an estimated cost of £13,500.

Canada.—Railway Electrification.—According to *Commerce Reports*, a motion is to be proposed to the City Council of Montreal asking that body to consider passing by-laws authorising the electrification of all railways within the city. The legislation will be designed to apply to all trains, whether passenger or freight, and will make it necessary for the railways to change engines at the city limits.

Continental.—France.—The electrification of the Paris-Orléans railway, which was commenced four years ago, has been completed, and the service was inaugurated on October 6th. The Paris correspondent of *The Times* reports that ten passenger trains will run daily between Paris and Orléans, a distance of 75 miles. By the end of the year the system will be extended to Vierzon, about 50 miles farther to the south on the main line. A new power station, which is under construction, will be put into service about the same time, increasing the power at the disposal of the railway by about 50,000 kW. The Paris-Orléans railway has now nearly 100 miles of electrified lines, and ultimately the whole line from Paris to Toulouse will be electrically operated.

Ilford.—Year's Working.—The accounts of the Urban District Council's tramway undertaking (manager: Mr. L. E. Harvey) for the year ended March 31st last record a total revenue of £69,821, as compared with £69,597 in 1924-25. Working expenses amounted to £56,365, as against £57,676, leaving a gross profit of £13,456 (£11,921), to which was added rent of leased line (East Ham) £1,955, making a total of £15,411. Capital charges absorbed £12,965, and there was a net profit of £2,446, as compared with £1,044 in the preceding year. The number of passengers carried increased from 13,618,970 to 14,169,251, and the car miles run from 958,058 to 1,014,854. The average traffic revenue per car-mile fell from 16.90d. to 16.393d.

Japan.—New Electric Railway.—*Commerce Reports* states that application has been made for the construction of an electric railway about 43 miles long in Japan, through the mountains from Toyohashi, Aichi Prefecture (on the Tokaido main line) to Lida, Nagano Prefecture. The Toyokawa Railway of Toyohashi, the Horaiji Railway, the Shimo-Ina Railway, the Diado and the Toho electric power companies, and others are promoters.

London.—Temple Station.—It is reported that work on the reconstruction of Temple Underground station is to commence immediately. The booking hall is to be enlarged and passimeters installed.

New Zealand.—Railway Electrification.—The Government has received a report from Messrs. Merz & McLellan, consulting engineers, on the question of electrifying the suburban railway systems of Wellington, Auckland, and Christchurch. The capital outlay at these centres respectively would be £830,800, £815,700, and £428,400.—*Tenders.*

St. Helens-Wigan.—Through-Running.—An agreement has been entered into between the St. Helens and Wigan Town Councils and the Lancashire United Tramways, Ltd., for the through-running of tramcars between the two towns. The new service will run through Ashton-in-Makerfield, where a connection between the Corporations' systems has been made.

Telegraph and Telephone Notes.

Australia.—Wave-length.—There is some concern among amateurs lest experimental work will be curtailed by the "beam" wireless service between Australia and Great Britain. At present Australian amateurs have allotted for their use, with others, the wave-length band extending from 32 to 37 metres and, though no definite announcement of the wave-length to be used by the "beam" stations has yet been made, it is understood that an application will be made for a wave about 30 metres long.

New Station.—After having been in use since 1912, the wireless station in Melbourne, known as the "Domain" station, whose call letters are VIM, is to be closed down. Amalgamated Wireless (Australasia), Ltd., which took over the station some years ago from the Post Office, intends to build a new station at Braybrook, near Melbourne.—*Reuter's Trade Service* (Melbourne).

Canada.—Telephone Service.—There are more miles of telephone and telegraph wire per hundred of the population in Canada than in any other country in the world. Canada has 3.4 miles per 100; Toronto has 23.2 telephone instruments installed per hundred inhabitants, compared with 5.9 per 100 of the population in London.—*Reuter* (Ottawa).

Iraq.—Telephone Service.—The telephone service in Iraq is still limited to the cities of Baghdad, Basra, and Mosul, where it was largely installed under the auspices of the British military authorities. The city of Basra has a successful automatic telephone system as well as a commercial wireless station in regular communication with Cairo (Egypt) and Beirut (Syria).

Italy.—Cable Contracts.—A project has been approved by the Italian Government for the laying of a telephone cable between Naples, Rome, and Milan. The cable, which will be composed of 400 circuits placed underground, is estimated to cost 500,000,000 lire, including construction work, which is expected to take between four and five years.—*Reuter's Trade Service* (Milan).

Jugo-Slavia.—Automatic Telephony.—At the present time the country's telegraph system extends to 13,030 miles and the telephone system to 9,295 miles of line. Automatic telephone exchanges are to be established in the towns of Zagreb, Ljuhljana, and Novi-sad. A number of new telephone cables are being laid, and one is to be established between Belgrade and Soiebotissa.

Pacific Cable Board.—It is reported that the traffic receipts for the past year fell by £81,416 to £453,596. The decrease is attributed to the loss of United States business and to rate reductions.

Smyrna.—Telephone Concession.—Allmaenna Telefonaktiebolaget L. M. Ericsson, in keen competition with other firms, has obtained a concession for telephone activity in Smyrna for the period of thirty-five years.—*Reuter's Trade Service* (Stockholm).

Radio Notes.

Denmark. — Licences. — The Commercial Secretary at Copenhagen has forwarded to the Department of Overseas Trade a translation of a decree which reduces the tax to be paid during the period April 1st, 1926, to March 31st, 1927, to the Radio Broadcasting Fund for use of receiving sets. The amounts are for apparatus acquired or constructed after October 1st, 1926:—For a crystal set, 5 kroner; for a valve set, or set in which valves are used as amplifiers, 7.50 kroner. Formerly the amounts were kroner .10 and 15, respectively.

Germany.—Leipzig Station.—Although the new station on the fairgrounds just outside the city of Leipzig has a maximum input power of 9,000 watts, but 2,000 to 3,000 watts on a wavelength of 452 metres will be used for general broadcasting. Leipzig ranks third among German cities in the number of listeners, 121,423 having been registered by the post office.

Short-wave Station.—The official length of the Berlin short-wave transmitter has not yet been determined; for the time being it is operating on 52 m., and *World Radio* finds it difficult to express an opinion about the efficiency of the plant.

Langenberg Station.—The masts of this new station are 100 m. high and 220 m. apart; its power will be 20 kW in the aerial, the largest in Europe, and it will possibly use a 468.8-m. wave.

India.—Broadcasting Prospects.—Amongst the wireless dealers in Bombay there is evidence of a more optimistic feeling than has been the case for many months past, writes our correspondent in India. Actual sales are at the moment almost nil, but since the publication of the prospectus of the Indian Broadcasting Company, with its entire initial issue of capital underwritten by responsible people, traders have received a steady flow of inquiries regarding wireless sets, and it is noteworthy that a very large proportion of the potential buyers are hankering after powerful apparatus which will enable them to tune in not only the new station at Calcutta, but also the programmes broadcast in England and America. There is also a distinct boom in orders for the overhaul and repair of sets which have been put "on the shelf" during the past few months. The immediate effect is a reorganisation of selling methods, a typical example of which is the announcement that Messrs. Fazalbhoy & Sons are separating their wireless and motor-car departments and are housing the former in new premises; it will be operated as a separate concern to be known as the Bombay Radio Co., Ltd., with showrooms wherein wireless apparatus can be demonstrated. Simultaneously, another well-known firm is negotiating for showrooms, and a British firm hitherto unknown in India has similar ideas.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Ashford. — Electricity Committee. 30-kW motor generator. (October 8th.)

Australia. — Melbourne. — November 3rd. Postmaster-General's Department. Pole transformers. (B.X. 2914.)* Pole-changing transformers. (B.X. 2915.)*

November 9th. Telephone transformers. (B.X. 2797.)* Telephone protective apparatus. (B.X. 2840.)*

November 26th. Primary battery material. (B.X. 2900.)*

Sydney.—November 15th. 33,000-V cable and pilot cable. (Spec. 1,047.) (B.X. 2882.)*

November 29th. Circulating water screens. (Specification 1,014.) Specifications from Constructional Engineer, Electricity Department, Town Hall, Sydney.

November 29th. Induction voltage regulator. (B.X. 2936.)*

Barry.—October 25th. Gas, Water, and Electricity Department. Underground mains, sub-station transformers, and meters. (September 24th.)

Belgium.—October 27th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Telephone cables for the Liége and Verviers districts. Particulars (Cahier des Charges Special No. 3-228) for 5 fr. 35 c.

Bury.—October 25th. Board of Guardians. Electro-massage and X-ray departments at Bury Infirmary. Particulars from Mr. A. C. M. Lillie, architect, Brownedge, Bamber Bridge, Preston.

Carlisle. — October 18th. Electricity Department. Lagging of the complete steampipe system at the new generating station. (October 1st.)

Dublin.—October 18th. Electricity Supply Department. Four water-tube boilers, stokers, economisers, feed pumps and accessories, necessary buildings, foundations, &c. (September 10th.)

5,000-kW generating set complete. (September 17th.)

Dundee.—October 22nd. Electricity Department. 4-core, 3-core, and 2-core l.p. lead-covered cable. (October 8th.)

Eastbourne.—November 5th. Electricity Department. One water-tube boiler, economiser, feed heaters, two steel chimneys with induced-draught plant, interconnecting pipework, &c. (October 8th.)

Edinburgh.—October 18th. Electricity Supply Department. Two motor-driven circulating water pumps, drainage pump, valves and pipework. (September 17th.)

October 25th. Education Authority. Electrical work at additions to Hermitage Park School, Leith. Schedules from Mr. T. Aikman Swan, architect, 7, St. Colme Street, Edinburgh.

Glasgow.—October 19th. Parish Council and District Board of Control. Stores, including electrical fittings, for six months. Forms from Mr. M. A. Reynard, clerk, 266, George Street.

Ilford.—October 26th. Electricity Department. Transformer kiosk, transformer and switchgear, switch kiosk and switchgear, l.p. paper-insulated cables. (October 8th.)

India.—October 20th. India Store Department. Sub-station plant for Ridge Institute, Jubbulpore, including transformers, condensers, cables, ironclad switchgear, &c. (October 1st.)

London.—Metropolitan Asylums Board.—November 3rd. Installation of automatic telephones and fire alarms and alterations to electric lighting installation at the North-Eastern Hospital, St. Anne's Road, Tottenham, N. (See this issue.)

Newcastle-on-Tyne.—October 29th. Tyne Improvement Commissioners. One 3-ton and one 5-ton portal electric travelling level luffing cranes. Specifications from Mr. A. Blacklock, secretary, Tyne Improvement Commission Offices, Bewick Street, Newcastle-upon-Tyne.

New Zealand. — Wellington. — November 23rd. Public Works Department. Lightning arresters and transformers. (B.X. 2792.)*

November 30th. 110-kV transformers. (B.X. 2874.)*

December 7th. Induction regulator. (B.X. 2935.)*

December 10th. Government Railways. Electric motors. (B.X. 2861.)*

January 4th. Switchgear and transformers for the Waikaremoana electric power scheme. (B.X. 2872.)*

February 1st, 1927. Storage battery and booster for Waikaremoana. (B.X. 2937.)*

Invercargill.—December 1st. Southland Electric Power Board. One 3,200-h.p. horizontal Francis turbine and one 2,350-kW generator. (B.X. 2822.)*

Rochdale.—October 20th. Board of Guardians. Electrical plant for the Poor Law Institution and Infirmary at Birch Hill, Dearnley, Littleborough, Lancs. (See this issue.)

Stoke-on-Trent.—E.h.p. switchgear for central power house, e.h.p. switchgear and moulded stone for Stoke sub-works, and neutral earth resistance for central power house. (See this issue.)

South Africa.—Port Elizabeth.—November 25th. City Engineer's Department. Duplicate electrically-driven automatic centrifugal pumps, including piping, &c., for sewage pumping. (A.X. 3680).*

Wolstanton (Staffs.). — October 23rd. Staffordshire County Education Committee. Electric wiring of Wolstanton Boys' New Secondary School. (October 1st.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—Melbourne.—Victorian State Electricity Commission.—In connection with the reorganisation of operations at the brown coal works at Yallourn, Victoria, the Commission recently called for tenders for three electric locomotives for the transport of coal to the power house. Of the four tenders received, three were for manufacture in Germany and one in America. No tenders were submitted for plant of British and Australian make. The acceptance has now been approved of the lowest tenders, submitted by Gollin & Co., Ltd., Melbourne, as agents for the Siemens Schückertwerke, Berlin, the total price for the three locomotives and spares being £12,128 c.i.f. and e., Melbourne.—*Reuter's Trade Service* (Melbourne).

Beckenham.—Electricity Committee. Accepted:—
Switchgear for new sub-station (£357).—New Switchgear Construction Co., Ltd.

Belgium.—International competition was again experienced when the municipal authorities of Schaerbeek, Brussels, opened tenders on October 1st for the supply of 3½ kilometres of armoured l.p. cable, offers being received from Belgian, German, British (Callender's Cable & Construction Co., Ltd.), French, Czecho-Slovakian, and Dutch concerns. There was considerable variation in the quotations, the lowest being that of the Duisburg Cable Works (Germany).

Birkenhead.—Electricity Committee. Accepted:—
½ mile of .2 sq. in. l.p. 4-core cable (£713); 1½ miles of .1 sq. in. do. (£1,336); 1 mile of .06 sq. in. do. (£632); 1½ miles of .04 sq. in. do. (£742).—Macintosh Cable Co., Ltd.

Bury.—Town Council. Accepted—
Overhauling and converting to electric power the hoist at the Art Gallery.—John Burgoine & Sons, Ltd.

Chester.—Board of Guardians. Accepted:—
Electrical fittings for six months.—Commercial Electric Co.

Chesterfield.—Town Council. Accepted:—
Distributor cable (£618).—W. T. Glover & Co., Ltd.
Feeder cable (£175).—Standard Telephones & Cables, Ltd.
One 100-kVA transformer.—Brush Electrical Engineering Co., Ltd.
Grit arrester.—Tipton Tub and Tube Co., Ltd.

Croydon.—Board of Guardians. Accepted:—
Electrical fittings and appliances for 6 months.—Baxter & Caunter, Ltd.

Denmark.—The contract for building a 5-kW broadcasting station near Kallundborg for the Danish Telegraph Administration, mentioned in our last issue, was secured by Standard Telephones and Cables, Ltd., and all the equipment will be manufactured in London.

Doncaster.—Electricity and Tramways Committee. Recommended :—
6,000-kW turbo-alternator and condensing plant (£20,570).—British Thomson-Houston Co., Ltd.
L.p. cables.—Enfield Cable Works Co., Ltd.

Erith.—Urban Council. Accepted:—
Cable for the new housing scheme (£388).—Callender's Cable and Construction Co., Ltd.
Three 100-kVA transformers (£385).—British Electric Transformer Co., Ltd.
H.p. switch panel (£55).—British Thomson-Houston Co., Ltd.

Henley-on-Thames.—Town Council. Accepted:—
Installing electric light at the Town Hall.—Messrs. Felgate, Reading.

High Wycombe.—Education Committee. Accepted:—
Installing electric light at Green Street schools.—H. Milner.

London.—BERMONDSEY.—Baths Committee. Accepted :—
25 h.p. electric motor at bath laundry (£89).—Lancashire Dynamo and Motor Co., Ltd.

H.M. OFFICE OF WORKS.—Accepted :—
Switchboard.—Edison Swan Electric Co., Ltd.

LONDON COUNTY COUNCIL.—Education Committee. Accepted :—
Electric lighting installation in two blocks of dwellings on the East Hill estate, Wandsworth :—

Smethurst & Co. (London), Ltd. (Accepted.)	**£2,067**
Electrical Installations, Ltd.	2,091
L. G. Tate & Co., Ltd.	2,134
H. J. Cash & Co., Ltd.	2,169
A. Hawkins & Sons	2,172
A. Dean & Co., Ltd.	2,233
Heath Pritchard, Ltd.	2,246
T. Clark & Co., Ltd.	2,317
Commercial Telephone and Electrical Co., Ltd.	2,349

The chief engineer's comparable estimate is £2,075.

Wiring and fittings for electric lighting at Frankham Street, Deptford, school (£141); electrical work at Haimo Road (£340).—Commercial Telephone & Electrical Co., Ltd.

Leeds.—Electricity Committee. Accepted:—
Cables (£1,308), Enfield Cable Works, Ltd.; (£2,098), W. T. Henley's Telegraph Works Co., Ltd.; (£2,088), Macintosh Cable Co., Ltd.

Library Committee. Accepted :—
Electric lighting extensions (£270).—R. F. Winder, Ltd.

Liverpool.—Tramways Committee. Accepted:—
New tramway junction.—Titan Trackwork Co., Ltd.

New Zealand.—CARTERTON.—Wairarapa Electric Power Board.
150 time switches.—Venner Time Switches, Ltd.

Oldham.—Electricity Committee. Accepted:—
Cable.—Union Cable Co., Ltd.
Switchgear.—Ferguson, Palin, Ltd.

Plymouth.—Electricity Committee. Accepted:—
Switchgear (£612), battery (£12).—A. Reyrolle & Co., Ltd.
3-phase transformers (£1,382).—British Electric Transformer Co., Ltd.

Salford.—According to the *Manchester Guardian*, at a meeting of the City Council last week the Electricity Committee recommended the acceptance of the tender of a Dutch firm, at £1,062, for the supply of cables. Councillor Worthington, as an amendment, moved the reference back of the minute, and a direction that the Committee should accept the tender of Messrs. W. T. Glover & Co., Ltd., amounting to £1,248. On previous occasions, Mr. Worthington said, he had protested against sending work out of this country to the detriment of British working men. A number of Salford men were in the employ of Messrs. Glover, and when the difference in the tender was less than £200, he felt the contract should go to the local firm so as to keep local men employed. Councillor Finburgh, M.P., said he had spoken before against contracts going abroad so long as there were so many unemployed men in this country. He intimated that he would take an early opportunity of tabling a notice of motion with the object of settling once and for all whether foreign tenders should be entertained.—The amendment was negatived, and the Committee's recommendation approved.

Ticehurst.—Board of Guardians.
Installing electric light at the Institution.—Wallis, Ltd.

Torquay.—Electricity Committee. Accepted:—
E.h.p. cell work and instrument panel (£150).—British Thomson-Houston Co., Ltd.
Meters (£135).—Aron Meter Co.

Forthcoming Events.

International Exhibition of Inventions.—At the Central Hall, Westminster, S.W. October 13th to October 23rd.

Junior Institution of Engineers.—Friday, October 15th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette on "China from the Engineer's Point of View," by Mr. R. L. Sarjeant.
Friday, October 22nd. Lecturette on "Boiler Accidents," by Mr. R. H. Kenyon.

British Electrical Development Association.—Friday, October 15th. At The Royal Society of Arts, John Street, Adelphi, W.C. At 7.30 p.m. Lecture on "Wiring the Homes of Britain," by Mr. V. W. Dale.

Electrical Trades Commercial Travellers' Association.—Friday, October 15th. At The Old Colony Club, Aldwych House, W.C.2. At 7.30 p.m. Bohemian Concert

Diesel Engine Users' Association.—Friday, October 15th. At Caxton Hall, Westminster, S.W. Paper on "A Note upon the Obligation of the Ironfounder to Diesel Engine Users," by Mr. H. J. Young.

Birmingham Electric Club.—Friday, October 15th. At the Grand Hotel, Colmore Row. At 7 p.m. Lecture on "Radio," by Mr. J. Entwistle.

National Association of Supervising Electricians.—Wednesday, October 20th. Visit to Barking power station.

Institution of Fuel Economy Engineers.—Wednesday, October 20th. At the Connaught Rooms, W.C.2. At 1 p.m. Luncheon. Address by the Rt. Hon. Sir Robert Horne, M.P.

Society of Technical Engineers.—Wednesday, October 20th. At 102, Belgrave Road, S.W.1. At 7 p.m. Address on the "Work of the Society," by Mr. C. T. Inman, President of the London Central Branch.

Institution of Electrical Engineers.—Thursday, October 21st. At the Institution, Victoria Embankment, W.C.2. At 6 p.m. Address by the President, Dr. W. H. Eccles, F.R.S.

(Sheffield Sub-Centre).—Wednesday, October 20th. At the Royal Victoria Hotel, Sheffield. At 7.30 p.m. Address by the chairman, Mr. G. H. Nelson; and smoking concert.

(South-Midland Centre).—Wednesday, October 20th. At the Grand Hotel, Birmingham. At 6.50 p.m. Inaugural address by the chairman, Col. J. F. Lister.

Edinburgh Electrical Society.—Thursday, October 21st. At the Royal Scottish Society of Art, 117, George Street. At 8 p.m. Paper on "Dynamo and Motor Breakdowns," by Mr J. Walker.

Meter Engineers' Technical Association.—Thursday, October 21st. At the Lighting Service Bureau, 15, Savoy Street, W.C.2. At 7 p.m. Paper on "The Testing of Large-Capacity Meters *in situ*," by Mr. W. Casson.

International Motor Exhibition.—October 21st to 30th. At Olympia, London, W.

Notes.

Country House Fires.—As an outcome of the large number of fires which occurred in country houses during last winter, the Fire Prevention Department of the National Fire Brigades' Association has issued a list of suggestions for the guidance of owners and occupiers of country houses in the prevention of fires. With regard to electrical installations, strict adherence to the rules of the Institution of Electrical Engineers is advocated. Copies of the "Warning" may be obtained from the above department, 8, Waterloo Place, Pall Mall, London, S.W.1, on receipt of a stamped envelope with the application.

The Rating of Scottish Undertakings.—At the adjourned Burgh Valuation Appeal Court in Aberdeen on October 7th, the appeal by Aberdeen Corporation on behalf of its electricity undertaking was again under consideration. For the Town Council it was stated that the valuation had risen from £38,464 in 1923 to over £63,000 in 1925-26, and this year the department offered £60,000, so that as a rate-producing subject the undertaking had practically doubled in the last four years. Counsel for the Assessor mentioned that the Assessor's figure was £66,855. His contention was that, applying the revenue principle, combined with the judgment of Lord Skerrington, which he had submitted, it was immaterial for the Court to consider the purpose for which the reserve was applied, it was sufficient to have made the revenue. The Court dismissed the appeal and upheld the Assessor's figures. Counsel for the Corporation asked the Court to state a case for appeal to a higher court.

The Scottish section of the I.M.E.A. is supporting the appeal, and has urged other Scottish undertakings to contribute to the costs of the litigation. The Glasgow Corporation has agreed to subscribe up to £90.

Manchester Electro-Harmonic Society.—The Society will commence its eighth season with a concert, to be held in the "Manchester" Restaurant to-day. We are informed that the prospects for a successful season are extremely bright, and the number of membership cards already issued indicates the continuance of staunch support, which has been a characteristic of the meetings in the past. The meetings will now be held in a well-appointed hall under the Royal Exchange, instead of the Albion Hotel. Visiting friends should particularly note this change of venue, and a hearty invitation is extended to all electrical people who may be in Manchester on the dates of the Society's concerts. These are :—October 15th, November 19th, and December 17th, 1926; and January 21st, February 18th, and March 18th, 1927. Mr. C. E. Leak, the hon. secretary, 196, Deansgate, Manchester, will be glad to receive intimation from intending visitors. No charge is made for admission, and members of the Society will welcome the opportunity of meeting their *confrères* from other parts of the country. Further information may be obtained from the same source by anybody engaged in the electrical industry in and around Manchester who may desire to become a member of the Society. Mr. J. A. Robertson, M.I.E.E., has again consented to be president, and will occupy the chair at the opening concert. The programme, in future, will be controlled by a Music Committee consisting of five members appointed by the general meeting. The programme for the first concert affords evidence that the high standard of entertainment already achieved by the Society will be adequately maintained.

Appointments Vacant.—Assistant in Meter Department (£150) for the West Gloucestershire Power Co., Ltd. Assistant electrical engineer ($400 per month, dollar=2s. 4d.) for the Government of the Federated Malay States. Workshop superintendent, technical instructor, and divisional engineer (£720+) for the Posts and Telegraphs Department of the Government of the Gold Coast. Two assistant telephone engineers for the Oriental Telephone and Electric Co., Ltd. Combustion engineer for the North Metropolitan Electric Power Supply Co., Ltd. Installation engineer for the Electricity Distribution of North Wales and District, Ltd. Chief clerk for the Stratford-on-Avon Electricity Co., Ltd. (See our advertisement pages to-day.)

The Electricity Bill and South-East Lancashire.—At a meeting of a special committee of the South-East Lancashire Electricity Advisory Board, on July 27th, an interesting report of an interview between representatives of the Board and the Electricity Commissioners was read and discussed. This report has now been published. It arose out of the question of constituting a Joint Electricity Authority for the District to replace the Advisory Board, which had been under consideration since the end of June, as a result of the changes made in the Electricity (Supply) Bill by Standing Committee C of the House of Commons. After discussing the report, the Special Committee resolved that there was a *prima facie* case for adopting this course, which was originally proposed in a memorandum by Mr. W. J. H. Wood dated June 29th, 1926.

The report details certain questions that were put to the Electricity Commissioners and the answers that were given. From these it appears that the proposed Central Board's area schemes need not relate to any area as at present constituted, but would probably include several Electricity Districts in a single scheme; for instance, South-East Lancashire, Mid-Lancashire, West Lancashire, North Wales, and the West Riding—or even the whole of Yorkshire—might form an area of the Board's scheme, but the existing delimited Districts and the organisation thereof need not be altered. The Commissioners favour the creation of Joint Electricity Authorities, which would exercise executive powers which the Board will not possess; the powers of the Board would probably be delegated to such Authorities, particularly in relation to the construction of secondary transmission lines, and the control of operation of stations. The main transmission lines of the Board's "grid" will probably work at 132,000 volts. The setting-up of a J.E.A. consisting of a small number of representatives with powers to act for the Board in relation to the pooling of supplies, the operation of existing stations if the owners failed to extend them, the building of new stations if authorised undertakers were unwilling to do this, and the furnishing of supplies in areas not covered by distribution orders, appeared to the Commissioners to be a useful basis for consideration.

Mr. Wood's memorandum is printed with the minutes of the Committee, and is an able review of the situation created by the Bill as amended in Committee, pointing out the administrative difficulties that are likely to arise in the South-East Lancashire District if a Joint Electricity Authority is not in existence when the Board commences operation. It is anticipated in the memorandum that if the District is thus developed by a J.E.A., the result will be a lower tariff within the area than the national tariff proposed by the Bill.

Another pamphlet issued by the Advisory Board is a report on the amendments to the Electricity (Supply) Bill, conveniently showing the changes that have been made in Committee, and emphasising the view that if the South-East Lancashire undertakers were permitted to have a district tariff, it would in all probability decrease more rapidly than a national tariff.

Edinburgh Infirmary Radiological Department.—The Duke and Duchess of York visited Edinburgh on October 8th, when His Royal Highness was presented with the freedom of the city, after taking part in a number of interesting public functions, his most important engagement being at the world-famous Royal Infirmary of the city, where he opened the new Radiological Department, which is now one of the finest of its kind in the kingdom. The department is housed in a three-floor building, erected in the grounds of the Infirmary, and in convenient association with the wards. Twenty thousand patients passed through the old Radiological Department in one year, and it is computed that in the new department at least double that number will be treated. Although a beginning has only been made, on a recent day 200 patients received electrical treatment and massage.

The X-ray and electro-medical apparatus has been installed by Messrs. Watson & Sons (Electro-Medical), Ltd., under the supervision of Mr. W. Rennie.

There was a large and distinguished gathering. Lord Provost Sir W. L. Sleigh presented the members of the reception party, which included Sir James Hodsdon, Convener of the Medical Electrical Committee, Col. G. St. C. Thom, the superintendent, Sir John Gilmour, members of the Senatus of the University, Dr. Woodburn Morison, medical officer in charge of the department, and others.

The Lord Provost, in opening the proceedings, gave some details regarding the origin of that great department. X-ray work began in the Royal Infirmary, Edinburgh, under Doctors Milne Murray and Dawson Turner, in 1898. In 1909, Dr. Dawson Turner was succeeded by Doctors Hope Fowler and McKendrick, who carried on the work until the new Radiological Department was built. It was deemed advisable, owing to the great increase in the work—over 23,000 examinations having been made in 1925—and to the necessity of the medical student having more extended instruction in this science, to appoint a radiologist, who would devote his whole time to the work of the department and to the teaching of radiology. Dr. Woodburn Morison was appointed to this post and to a lecturership in radiology in the University of Edinburgh. Towards the construction of the building and of its equipment, the Edinburgh Committee of the Scottish Branch of the British Red Cross Society contributed £15,000. The total cost was estimated at £52,000.

In conclusion, his Lordship paid a tribute to the gentlemen who had taken a leading part in the conception and bringing into being of that important addition to the hospital. He referred to Dr. Robert Knox, London, who had acted as honorary expert adviser, Sir James Hodsdon, as Convener of the Medical Electrical Committee, Mr. G. Somervel-Carfrae, civil engineer, Convener of the House Committee, Dr. Woodburn Morison, Medical Officer in charge of the Department, and Mr. Turnbull, the Infirmary Master of Works.

The Duke of York, on rising to declare the new department open, remarked that the Royal Infirmary was maintained entirely by voluntary contributions; the total ordinary income amounted last year to nearly £110,000, whilst the extraordinary income, which was made up of all legacies and donations, came to more than £75,000, but the needs of a hospital such as that must ever increase. The staff of physicians and surgeons, composed of the leading men in the medical profession in Edinburgh, gave their services voluntarily.

Sheriff Crole proposed a vote of thanks to his Royal Highness, and the Duke and Duchess inspected the department under the guidance of Sir James Hodsdon and Dr. Woodburn Morison. They showed special interest in the artificial sunlight treatment which has proved so beneficial in the case of backward children and particularly those suffering from rickets. It was pointed out that the children are allowed to run about in the room under the powerful lamps, their eyes protected by special glasses. Radiology will be taught in the new department to students in medicine and, in addition, the University of Edinburgh has established a Diploma in Radiology.

Diesel-Electric Ferries.—The Southern Pacific Railroad has awarded a contract to the New London Ship and Engine Company, New London, Conn., for the construction of two Diesel-electric automobile ferries for service at San Francisco. Each boat will cost $625,000, and be 256 ft. long, with a beam, over guards, of 61 ft. 3 in., and a passenger capacity of 500. The automobile capacity will be 80 cars each. The "Nelseco" engines to be installed will be of 450 b.h.p. at 250 r.p.m.—*Reuter's Trade Service* (San Francisco).

Television.—The first of a series of "popular talks" in aid of King Edward's Hospital Fund for London, was given at the Royal Institute of British Architects on Thursday last week by Mr. J. L. Baird, on "Seeing by Wireless." Sir Richard Gregory, D.Sc., occupied the chair, and expressed the hope that the elementary apparatus which Mr. Baird had evolved for effecting television would develop into a practical form more rapidly than the telephone had done.

The lecturer remarked that seeing at a distance was really no more strange than hearing by telephone, with or without wires. After explaining how sound waves were converted into fluctuating electric currents, and reconverted into sound waves at the receiving station, he said that television involved very much the same process; all that passed through the wires or the ether was a fluctuating current of electricity, in either case. Mr. Baird showed a photograph of an image seen on the screen of the first televisor that he had made, and proceeded to review the history of the subject, pointing out that selenium was too sluggish in its reaction to light, and too insensitive, to be of service in television, which consequently remained at a standstill for 30 years. The invention of photo-electric cells, instantaneous in their action, aroused renewed interest in the problem, and for the past four years he had devoted the whole of his attention to its solution. The first public demonstration of his process was given in 1925; since then his apparatus had been entirely remodelled, and the clearness of the images had been greatly improved, but although much more sharp and distinct, they still remained mere black and white effects, without detail and without gradation of light and shade. He made many attempts to improve the light-sensitive cell, including the construction of a cell made from "visual purple" out of a human eye. This cell when first constructed gave an appreciable reaction to light. He was not at liberty to give technical details of the device finally developed, but towards the end of 1925 the difficulties were successfully overcome, and the images of various objects, including the living human face, were transmitted with half-tones and details. The images were at that time very defective, comparable with the earliest kinematographs, but the defects, chiefly due to mechanical and electrical imperfections, were being steadily eliminated, and he expected to place on the market a commercial machine within the next twelve months.

Local Societies. — Aberdeen Mechanical Society. — Mr. A. H. McKay, A.M.I.E.E., has been elected president of the Society. In the course of a lecture entitled: "Some Notes on the Application of Electricity to Industrial Purposes," he said that a good deal could be done for speeding-up tramcars. If 'buses were to be allowed to "fly about" all over the place, why should the speed of tramcars be restricted?

Northampton Engineering College Engineering Society.—The first paper of the session will be read on Wednesday, October 20th, at 5.30 p.m., by Mr. H. Boden, on "Steam Turbines for Industrial Purposes."

Electrical Association for Women.—Visit to Paisley Power Station.—Members of the Electrical Association for Women (Glasgow and District Branch) were the guests of the Paisley Town Council at Blackhall power station recently. The visitors, numbering about one hundred, were received by Bailie John A. Balderston, convener of the Electricity Committee, and Mrs. Balderston, and the party was shown over the works by Mr. W. Blair Smith, engineer and manager, and his staff. Refreshments were served in the drawing office.

Finsbury Technical College Old Students' Association.—The 15th annual dinner of the Association will be held at the Engineers' Club, on Saturday, October 30th. Tickets, price 7s. 6d. each, exclusive of wine, can be obtained from the hon. secretary, Mr. R. O. Grant, 30, Bedford Row, W.C.1. Any old student will be welcomed, and ladies are invited. Early application is necessary.

Mining Disaster in Natal.—A disaster, described as the worst in the history of the South African mining industry, is reported to have occurred on Friday last at the Durban Navigation Colliery. It is stated, on the evidence of a native assistant electrician who died shortly after his rescue, that the electrician, Mr. McLaughlin, stumbled and dropped a live cable on a rail; a spark followed, which ignited the coal dust, causing a violent explosion. The electrician was killed, and the night-shift men were imprisoned by falls of rock; rescue operations were commenced, during which mine-captain Shirlaw was fatally gassed, but there was no hope that any of the miners would escape suffocation. *The Times* states that five Europeans and 114 natives perished.

The Third Party in Industry.—At the Conservative Conference at Scarborough last week, Sir Wilfred Sugden, M.P., moved:—"That this conference views with concern the resolution adopted by the Trade Union Congress at its 1925 meeting, calling on all unions of manual workers or others to boycott protective associations of administrative staffs engaged in industry which adopt a third-party policy as against a policy of absorption into the labour ranks, and puts on record its view that non-manual workers can best serve the interests of industry and their own welfare by maintaining their industrial organisations under their own independent control." The resolution was carried unanimously. This is a declaration of policy of considerable importance to the members of such associations as the Society of Technical Engineers, the Electrical Power Engineers' Association, and similar bodies, which have striven for recognition as representing an essential factor in industry which is not inherently attached to the side of either the employers or the manual workers.

Electricity Charges in the City.—*The Times* reports that at a Wardmote held in the Ward of Farringdon Within this week, Mr. Howard Williams moved a resolution on the question of the high cost of electricity in the City. He moved to request the Corporation to inquire why the standard price, which by the Act of 1925 was to be fixed and to operate from January 1st last, had not been notified to the consumers. They were paying in the City, he declared, from 50 per cent. to 100 per cent. more for electricity than users outside the City boundaries. Mr. Corby, in seconding, urged the Alderman to do his best to get the Corporation to move in the matter. The Alderman agreed with the criticisms made, and compared the City charges unfavourably with those of Cape Town and its scattered surroundings.

Domestic Appliances.—On Tuesday last the Household Appliances Section of the London Chamber of Commerce held the second of its luncheons at the Holborn Restaurant. It will be remembered that the first luncheon was addressed by Mr. Goodenough, and electrical interests seemed to be less in evidence than they should have been. This criticism does not apply quite so forcibly to last Tuesday's proceedings, for we noted a number of representatives of electrical manufacturing and contracting interests, and the address was delivered by Sir Ernest Benn, Bart., who put forward the electrical case as well as that of other aspects of the domestic appliance question. In the course of his speech on "How Labour-Saving Devices in the Home Help the Nation," Sir Ernest referred to the conservatism of the British people in respect of domestic appliances as well as in other matters. He mentioned the higher stage of development reached in this connection in the United States, and thought that one of the purposes of the Section should be to develop the American "mechanical sense" amongst our own people. He quoted figures from the "Wiring the Homes of Britain" campaign to show how vast an undeveloped domestic field there was here, and other statistics to indicate that the gas interests felt that they too had but touched the surface of domestic custom. A later speaker referred to the important part that the hire-purchase system and the deferred payment system had played in bringing about the great expansion of the adoption of household appliances in the States.

New Automatic Sub-station.—On Tuesday last the Soho Square sub-station of the Charing Cross Electricity Supply Co., Ltd., was officially re-opened, after being closed for some time for important extensions and re-arrangement. The station was originally equipped with six mercury-arc rectifiers of a total capacity of 200 kW, but it has now been converted for fully automatic working. It now comprises an excavated chamber, approximately 42 ft. by 45 ft., which houses four 300-kW rotary converters and the necessary h.p. and l.p. switchgear and transformers. Complete sequence automatic operation is arranged for the four machines, and it is believed that this is the only sub-station in existence which embodies this feature. Provision is made for the installation of a fifth machine. The whole of the equipment was supplied by the Metropolitan-Vickers Electrical Co, Ltd.

Institution Notes.

Institution of Electrical Engineers.—ORDINARY MEETINGS, SESSION 1926-27.—The following programme has been issued for the first part of the session:—

October 21st.—W. H. Eccles, D.Sc., F.R.S. (president). Inaugural address.

November 4th.—J. R. Beard, M.Sc., and T. G. N. Haldane, B.A. "The Design of City Distribution Systems, and the Problem of Standardisation."

November 18th.—Dr. A. Ekstrom. Lecture on "The Applications of Electricity to Agriculture." (To be illustrated by a kinematograph film.) J. W. Beauchamp. Exhibition of a film entitled "American Agriculture and Farm-house Electrification."

December 2nd.—G. F. O'Dell, B.Sc. "An Outline of the Trunking Aspect of Automatic Telephones."

December 16th.—Colonel E. Mercier. "Notes on the 60,000-Volt Underground Network of the Union d'Electricité."

January 6th, 1927.—A. R. Cooper. "Electrical Equipment of Track on the Underground Railways of London."

SOUTH-MIDLAND CENTRE.—The first general meeting of the 1926-7 session will be held at the Grand Hotel, Birmingham, on Wednesday, April 20th, when the chairman, Col. J. F. Lister, M.I.E.E., will deliver his inaugural address.

Institution of Civil Engineers. — "JAMES FORREST" LECTURE.—It has now been arranged for this lecture, which was intended to be given in May, but had to be postponed, to be delivered at the Institution on Tuesday, October 26th, at 6 o'clock. The lecture will be given by Senatore G. Marconi, G.C.V.O., Hon. M.Inst.C.E., on the subject "Radio Communications." Before the lecture, the Kelvin Medal for 1926, which has been awarded by the Kelvin Medal Committee to the Hon. Sir Charles A. Parsons, K.C.B., F.R.S., M.Inst.C.E., will be presented to him by Sir William Ellis, G.B.E., President of the Institution.

Institute of Metals.—The programme of this Institute for the session 1926-27 has just been issued. It covers the work of the parent Institute, and also that of its six local sections. Over forty lectures, dealing with various phases of metallurgy, are enumerated in the programme, including the annual May lecture to be delivered by Sir Henry A. Miers, F.R.S. Copies of the programme can be obtained from the Secretary, Mr. G. Shaw Scott, M.Sc., 36-38, Victoria Street, London, S.W.1, who is also able to supply—at 2s. 6d. each—copies of any of the sixteen papers read at the recent Liége meeting of the Institute.

Institute of Transport.—PRESENTATION.—The Council has conferred its Aviation Gold Medal upon Sir Alan J. Cobham, A.F.C., in recognition of his noteworthy services to the development of Empire air communications. The presentation will take place at the meeting of the Institute to be held at the Institution of Electrical Engineers at 5.30 p.m. on Tuesday, 19th inst. Afterwards a lecture will be delivered by Captain F. L. Barnard on "Commercial Flying," illustrated by lantern slides. A limited number of tickets will be available for visitors.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Old Faradians will be interested to learn that Mr. J. N. ALTY, A.M.I.E.E., who was for many years lecturer at Faraday House Electrical Engineering College, London, has joined the staff of the British Electrical and Allied Industries Research Association.

Mr. R. A. EVANS, of Leicester, has been appointed provincial sales manager to Medway's Safety Lift Co., Ltd.

Mr. JAMES DUDLEY, for 33 years with the Wolverhampton Corporation Electricity Department, was last week presented with a case of pipes and a purse upon his retirement from the position of clerk of works. The presentation was made by Mr. Morgan, the borough electrical engineer.

The Heston-Isleworth District Council has confirmed the appointment of Mr. B. L. WELLS, B.Sc., assistant engineer at the Rio Tinto Mines, Spain, to be station superintendent at a salary of £359. He succeeds Mr. Broad, who recently resigned. There were 77 applications for the position.

On the occasion of his marriage at Castlechurch, Stafford, on September 25th, Mr. P. F. GROVE has been presented by his colleagues at the works of the English Electric Co., Ltd., with a silver entrée dish.

The Birkenhead Electricity Committee has appointed Mr. F. W. BRECKNELL (station superintendent) chief assistant electrical engineer for a probationary period ending on August 1st, 1927, in Grade 1 of the National Joint Board Scale (at present £569).

The Times says it is officially announced that Mr. P. L. GILL, A.M.I.E.E., has been appointed assistant electrical engineer in the Electrical Engineering Department, Admiralty. Further civilian appointments made include: Mr. E. F. KENT and Mr. H. MARTIN, senior electrical engineers, Chatham and Portsmouth Yards respectively; Mr. J. THOMSON, electrical engineer, Portsmouth Yard; Messrs. L. G. BOLTON, G. L. H. BROUGH, and H. D. MACLAREN, assistant electrical engineers, Dockyard Department, Admiralty, Devonport Yard, and Sheerness Yard respectively.

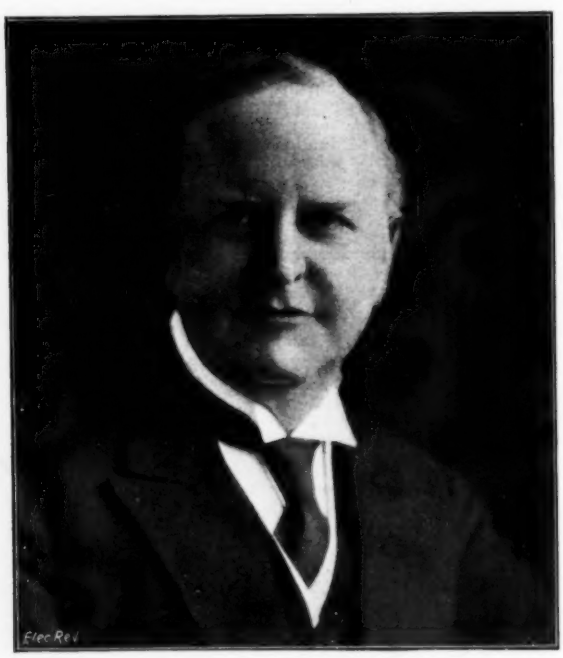
The British Broadcasting Co. announced last week that Mr. ERIC C. DUNSTAN, of its headquarters staff, has been appointed general manager of the newly-constituted Indian Broadcasting Co. He will enter upon his new duties at the beginning of next year.

Mr. CLAUD CROSLAND TAYLOR, managing director of the Crosville Motor Co., Ltd., of Chester, who is also chairman of the Chester Electricity Committee, has been nominated for the mayoralty of the city.

Mr. T. Gill, B.Sc., of Nelson, left for Rangoon on October 8th, where he is taking up an appointment as assistant electrical engineer to the Rangoon Electric Supply Co.

At a recent Stockton Town Council meeting Mr. Fairless, chairman of the Electricity Committee, declined to move his committee's minutes, which contained particulars of the proposed reorganisation of the staff, including the appointment of Mr. E. T. Seymour as mains superintendent, with charge of sub-stations, at a salary of £451 8s. Mr. Fairless submitted it was a post that should have been advertised, and said if the Council did not do so it would be a standing disgrace. The salary, which was according to scale, was higher than was being paid to several responsible sub-officials.—Alderman Goldstone moved the minutes back, but Coun. Birkbeck, supporting them, said the electrical engineer had assured the Committee that the members of his staff suggested for the positions were quite competent to carry out the duties.—After some further discussion, in which it was pointed out that Mr. Seymour had been doing the work since the death of the late superintendent, and that the recommendations as a whole would effect a saving of salaries, the Committee's report was approved by a large majority.

Mr. Ernest E. Sharp, A.M.I.E.E., is sailing on Thursday next by the *Grantully Castle* for a tour of South Africa on behalf of Venner Time Switches. Ltd., of which he is a director. The visit is one more journey to be taken in pursuance of the company's policy of maintaining close touch with its customers throughout the world. Mr. Sharp is an experienced traveller in pursuit of electrical business. Last year he toured South America and for the third time part of the United States. Earlier he travelled on the Continent somewhat extensively both on meter and time-switch business, while he also made two tours of Canada, where he established a meter branch for a well-known British firm. After technical education at the South-Western Polytechnic, Chelsea, Mr. Sharp entered the London branch of Messrs. Mather & Platt, Ltd., and was



Elliott & Fry] [London.

Mr. E. E. Sharp, A.M.I.E.E.

transferred to the Chloride Co. soon after it was formed. In 1900 he joined Messrs. Venner & Co., so that during over a quarter of a century he has had close relations with central-station authorities and has become a very familiar figure in such circles, as well as in other sections of the industry. His company made its first delivery of time switches in 1905. During the war Mr. Sharp was a Captain I.O.M. in France, and on leaving the Army he resigned his connection with the meter trade on the taking over of the business of Chamberlain and Hookham (for whom Messrs. Venner had been the sole agents) by the General Electric Co., Ltd. He is a member of the Council of E.D.A., and as such will naturally on his South African tour be interested in all phases of electrical advance He is a member of the recently-formed Meter Engineers' Technical Association and of the Clockmakers' Company.

Mr. T. Dalby is retiring from the position of power-station superintendent at Hackney electricity works in November, on superannuation. The Establishment Committee recommends that Mr. E. K. Wilkinson, assistant power-station superintendent, should be appointed to fill the vacancy for a probationary period of one year.

Mr. Henry Thompson, Stockton, who is in the service of the Marconi Co. at West Hartlepool as assistant inspector, was found unconscious by the roadside near Stockton last week, having apparently had an accident with his motor-cycle. He was taken to hospital, and is now improving.

Councillor Vernon Hope, electrical engineer, Upton Hall, Macclesfield, has been elected Mayor of the borough for the ensuing year.

It is reported that Lord Clarendon, Under-Secretary for the Dominions, is to be chairman of the British Broadcasting Corporation, which takes over the broadcasting services at the end of this year.

Obituary.—Mr. G. Chauvin.—We regret to learn of the death which occurred on Tuesday last, at 6, St. Aubyn's Mansions, Hove, of Mr. George Chauvin, late managing director of Messrs. Siemens Bros. & Co., Ltd He was 80 years of age. The interment takes place to-day at Hove Cemetery.

Mr. D. Rowan.—The death has occurred, at a nursing home following an operation, of Mr. Donald Rowan, head of the transmission department of the electrical plant of the Fife Coal Co.

Mr. E. H. Quarrington.—The death occurred suddenly on October 3rd of Mr. E. H. Quarrington, who had for the past three years been chief engineer in the Electrical and Mechanical Department of Messrs. Hazell, Watson & Viney, Ltd., Aylesbury. He was 51 years of age.

Mr. G. Davis.—According to the *Daily Telegraph*, a cable from Boston, U.S.A., reports the death of Mr. George Davis, vice-president and general manager of the Tropical Radio Co. "For many years he was an intimate friend of Senator Marconi and Mr. Edison, and also a director of the Radio Corporation of America, besides being one of the most eminent wireless authorities in the United States."

New Companies Registered.

Durrington Electric Light Co., Ltd. (216,571).—Public company. Registered October 2nd. Capital, £3,500 in £1 shares. Objects:—To carry on the business indicated by the title. Minimum cash subscription, 7 shares. The first directors are:—F. Deacon (chairman), Bulford Hill, Durrington, Wilts.; T. C. Bannister, Bulford Road, Durrington, Wilts.; H. L. C. Froom, Bulford Road, Durrington, Wilts.; J. E. Harris, Church Farm, Durrington, Wilts.; W. G. Lake, "Ivanhoe," Bulford Road, Durrington, Wilts.; A. G. Smith, Bulford Road, Durrington, Wilts.; W. F. Symons, "Sherwood," New Road, Durrington, Wilts.; P. A. Toomer, Bulford Road, Durrington, Wilts. Qualification, 25 shares. Remuneration as fixed by the company. Solicitors: Wilson & Sons, Salisbury. Registered office: Midland Bank Chambers, Salisbury.

Irish Radio Traders' Association, Ltd. (7,540).—Registered in Dublin on September 29th as a company limited by guarantee, without share capital. The objects are:—To promote and protect the interests of manufacturers of and dealers in radio apparatus and appliances, and all component parts thereof, &c. The directors are:—G. Darnley Smith, South William Street, Dublin (manager, Marconi (Ireland), Ltd.); H. D. Cansdale, 9, Eden Quay, Dublin (branch manager, Houghton Butcher (Gt. Britain), Ltd.); F. J. Sweetman, 51a, South William Street, Dublin (branch manager, B.N.B. Wireless, Ltd.); G. A. Pemberton, Dunlop House, Lower Abbey Street, Dublin (director, Brown Brothers (Ireland), Ltd.); J. H. Patton, 106-107, Middle Abbey Street, Dublin (assistant manager, Huet Brothers, Dublin); Edwin Hart, 8, Pearse Street, Dublin (salesman for the Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester); J. P. Digby, Corn Exchange, Burgh Quay, Dublin, wireless factor

W. H. Price & Newey, Ltd. (216,596).—Private company. Registered October 2nd. Capital, £2,000 in £1 shares. Objects:—To carry on the business of electrical and mechanical engineers, manufacturers, merchants and factors of all kinds of electrical and mechanical goods, motors, engines, &c. The permanent directors are:—W. H. Price, "Woodlands," Little Aston Road, Aldridge, near Walsall, electrical engineer (managing director and chairman); A. H. Newey, 5, North Street, Dudley, electrical engineer. Qualification, £100. Remuneration as fixed by the company. Solicitors: Loxton & Co., Walsall. Registered office: 57, St. Paul's Square, Birmingham.

E. K. Cole, Ltd. (216,572).—Private company. Registered October 2nd. Capital, £2,500 in £1 shares (1,500 cumulative 7 per cent. preference and 1,000 ordinary). Objects:—To acquire the business of manufacturing EKCO units, namely, instruments for deriving high- and/or low-tension supply for wireless receiving sets from the electricity supply mains now carried on by E. K. Cole, W. S. Verrells, and J. A. Maxwell at 513, London Road, Southend-on-Sea, as "E. K. Cole." The permanent directors are:—E. K. Cole, 2, Beedell Avenue, Westcliff-on-Sea; W. S. Verrells, 1, Cotswold Road, Westcliff-on-Sea; J. A. Maxwell, 3, Beedell Avenue, Westcliff-on-Sea. Qualification, 100 shares. Solicitor: R. T. Baker, Weston Chambers, Southend-on-Sea Registered office: 513, London Road, Westcliff-on-Sea, Southend-on-Sea.

Erlco (Electrical Services), Ltd. (216,424).—Private company. Registered September 25th. Capital, £4,000 in £1 shares. Objects:—To adopt an agreement with G. F Bravey and F. R. Blackmore, and to carry on the business of electrical, civil, mechanical, and general engineers, dealers in and repairers of electrical goods, motor vehicles, parts and accessories, wireless experts, &c. The directors are:—G. F. Bravey, 25, Linden Road, Reading, engineer; F. R. Blackmore, 14, Hamilton Road, Reading, engineer; H. J. Bartlett, 28, Holmes Road, Reading, merchant (all permanent). Solicitors: Ellis & Fairbairn, 22, Bedford Row, W.C.1. Registered office: 106, Friar Street, Reading.

T. S. F., Ltd. (216,673).—Private company. Registered October 7th. Capital, £200 in £1 shares. Objects: To act as sole agents for the import and sale in France and the French Colonies of headphones, loud speakers, and any other radio products manufactured by Brandes, Ltd., on the terms and subject to the conditions of an agreement dated July 23rd, 1926, between the above company and I. J. Lithauer. The subscribers (each with one share) are:—I. J. Lithauer, 10, Lymington Mansions, West Hampstead, N.W.6, radio factor; Enid M. Harwood, 11, Heston Park Road, Heston, Hounslow, clerk. I. J. Lithauer is the first director, and may retain office for life. Qualification (except first directors), £50. Registered office: 28, Sicilian House, Sicilian Avenue, W.C.2.

Warren Brothers (Middlesbrough), Ltd. (216,675).—Private company. Registered October 7th. Capital, £12,000 in £1 shares (8,000 ordinary and 4,000 deferred). Objects: To carry on the business of electricians as formerly carried on by J. W. F. Warren and S. N. Warren, as "Warren Brothers," at 15-17, Grange Road West, Middlesbrough. The directors are:—J. W. F. Warren, 32, Beech Grove, Linthorpe, Middlesbrough; S. N. Warren, 18, Sycamore Road, Linthorpe, Middlesbrough; J. H. Bunting, address not stated (all permanent, subject to each holding 100 shares). Qualification of ordinary directors, 100 shares. Remuneration as fixed by the company. Secretary: S. N. Warren. Solicitor: R. W. Smith, 33, Albert Road, Middlesbrough. Registered office: Electric House, Grange Road, Middlesbrough.

Ross-shire Electric Supply Co. (14,323).—The Ross-shire Electric Supply Co., Ltd., was registered as a "public" company on October 1st, in Edinburgh, with a nominal capital of £99,000 in £1 shares. The objects are: To acquire the undertaking of the Strathpeffer and Dingwall Electric Co., Ltd. (in liquidation). The minimum cash subscription is £30,000. The directors are:—Sir R. W. Brooke, Bt., Midfearn, Ardgay, Ross-shire; Lt.-Col. E. W. Blunt-Mackenzie, Castle Leod, Strathpeffer; G. D. Gill, Commercial Bank, House of Tain, banker; A. P. Gordon, J.P., Rindal, Portmahomack; T. S. H. Burns, Moorlands, Dingwall, law agent; R. S. F. Mackenzie, Allangrange House, Muchlochy, gentleman; and A. Henderson, The Retreat, Dingwall, ironmonger. Qualification, 100 shares. Remuneration, £2 2s. each per meeting attended. Secretary: C. G. MacDowell. The registered office is at 4, Tulloch Street, Dingwall.

Lothians Dynamo and Motor Co., Ltd. (14,325).—Private company. Registered in Edinburgh October 2nd. Capital, £2,500 in £1 shares. Objects: To carry on the business of manufacturers of dynamos, motors, and other electrical machines and machinery, electricians, &c. The subscribers (each with one share) are:—J. Livingstone, Ardbeg, Bathgate, hosiery manufacturer; W. Petrie Simpson, Viewbank, Bathgate, M.B.C.M. The first directors are not named. Secretary: J. Brown. Registered office: 54, South Bridge Street, Bathgate, West Lothian.

Woodstock Power Syndicate, Ltd. (216,580).—Private company. Registered October 2nd. Capital, £3,000 in £1 shares. Objects: To manufacture and supply gas for heating, power and lighting, and to adopt an agreement with the Woodstock Electric Light Co., Ltd. The directors are:—A. R. C. Johnston, 87, Twyford Avenue, Acton, W., merchant; A. R. Lay, Woodstock, glove manufacturer. Qualification, £100. Secretary: H. B. Wells, Abbey House, Westminster, S.W. Registered office: Abbey House, Westminster, S.W.

Official Returns of Electrical Companies.

India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.—Satisfaction in full on or before July 3rd, 1926, of debentures dated March 28th, 1916, securing £400,000. (Notice filed October 1st.)

B. N. B. Wireless, Ltd.—Satisfaction in full on September 25th, 1926, of debentures dated November 22nd, 1923, securing £150.

Bower Electric (1926), Ltd.—Particulars filed of £1,500 debentures authorised July 14th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Wilkinson, Bentley & Co., Ltd. (199,131).—Capital, £3,000 in £1 shares. Return dated September 23rd, 1926. 1,350 shares taken up. £1,315 paid. £35 calls unpaid. Mortgages and charges, nil.

Midget Lamp Co. (1924), Ltd. (199,639).—Capital, £2,000 in £1 shares. Return dated December 31st, 1925 (filed May 14th, 1926). All shares taken up. £2,000 paid. Mortgages and charges, £500.

Maybrook Electrical Co., Ltd. (199,685).—Capital, £1,000 in £1 shares. Return dated June 21st, 1926. All shares taken up. £1,000 paid. Mortgages and charges, £700.

Century Electric Co., Ltd. (199,792).—Capital, £5,000 in £1 shares. Return dated August 11th, 1926. 2,387 shares taken up. £2,387 paid. Mortgages and charges, nil.

Scattergood & Johnson, Ltd. (199,809).—Capital, £10,000 in 2,000 preference and 8,000 ordinary shares of £1 each. Return dated September 13th, 1926. 7,928 ordinary shares taken up. £1,252 paid. £6,676 considered as paid. Mortgages and charges, nil.

Cheddar Electric Supply Co., Ltd. (200,017).—Capital, £5,000 in £1 shares. Return dated July 9th, 1926. 4,822 shares taken up. £3,300 paid. £1,522 considered as paid. Mortgages and charges, nil.

Auto Mechanical Rectifiers, Ltd. (199,589).—Capital, £2,000 in 20,000 ordinary shares of 1s. each and 1,000 preference shares of £1 each. Return dated December 31st, 1925 (filed May 19th, 1926). All shares taken up. £1,100 paid. £900 considered as paid. Mortgages and charges at date of return, nil. Since registered, debenture dated July 8th, 1926, to secure £1,500.

Adamant Supplies Co., Ltd. (199,555).—Capital, £5,000 in £1 shares. Return dated July 23rd, 1926. 2,603 shares taken up. £502 paid. £2,101 considered as paid. Mortgages and charges, nil.

Cox-Cavendish Electrical Co. (1924), Ltd. (199,482).—Capital, £5,000 in £1 shares. Return dated June 11th, 1926. 4,344 shares taken up. £4,344 paid. Mortgages and charges, nil.

Tidal Power Syndicate, Ltd. (199,616).—Capital, £30,000 in 2s. shares. Return dated December 31st, 1925 (filed July 5th, 1926). 260,957 shares taken up. £26,095 paid. Mortgages and charges, £28,700. A return of allotments made up to June 22nd, 1926, shows a further 19,550 shares allotted for cash, 2s. being paid or due and payable on each share.

Colne Valley Electric Supply Co., Ltd.—Satisfaction to the extent of £1,500 on May 31st, 1926, of debenture stock secured by trust deed dated July 4th, 1925, securing £75,000.

Cumberland Waste Heat Owners Co., Ltd.—Debenutre dated September 24th, 1926, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Midland Bank, Ltd.

Wood & Co. (Ipswich), Ltd. (198,653).—Capital, £3,500 in 3,000 founders' shares of 1s. each and 2,350 ordinary and 1,000 preference shares of £1 each. Return dated July 30th, 1926. 3,000 founders', 2,350 ordinary and 900 preference shares taken up. £3,250 paid on 2,350 ordinary and 900 preference shares. £150 considered as paid on the founders' shares. Mortgages and charges, nil.

E. H. Millington & Co., Ltd. (198,898).—Capital, £2,000 in £1 shares. Return dated August 10th, 1926. 752 shares taken up. £752 paid. Mortgages and charges, nil.

Electro Therapeutic Supply Co., Ltd. (198,376).—Capital, £200 in 2,000 ordinary shares of 1s. each and 100 participating cumulative preference shares of £1 each. Return dated November 26th, 1925 (filed July 22nd, 1926). All shares taken up. £105 paid on 100 preference and 100 ordinary shares. £95 considered as paid on 1,900 ordinary shares. Mortgages and charges, £3,500.

Central Radio Stores, Ltd. (198,587).—Capital, £1,000 in £1 shares. Return dated December 18th, 1925 (filed May 16th, 1926). All shares taken up. £801 paid. £199 considered as paid. Mortgages and charges, nil.

H. Kaplan, Ltd. (198,489).—Capital, £5,000 in £1 shares. Return dated December 20th, 1925 (filed March 22nd, 1926). 4,000 shares taken up. £3 paid. £3,997 considered as paid. Mortgages and charges, nil.

Magnoid (Bristol), Ltd. (198,565).—Capital, £1,000 in 600 preference and 400 ordinary shares of £1 each. Return dated March 15th, 1926. All shares taken up. £400 paid on the ordinary shares. £600 considered as paid on the preference shares. Mortgages and charges, nil.

C. H. Rees & Co., Ltd.—Particulars filed of £2,500 debentures authorised August 18th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Western Electric Distributing Corporation, Ltd.

The report for the year ended June 30th, which was presented at the annual meeting on Friday last, showed a net profit of £11,372, to which was added £446 brought forward, making £11,818. After meeting the preference dividend, transferring £1,002 to reserve, and writing off part of the preliminary expenses, &c., it was decided to pay a final dividend of 7 per cent. from the date of the payment of instalments. A balance of £704 is carried forward. The capital of the company was increased to £156,602 during the year by the issue of 21,825 six per cent. cumulative preference shares and 34,777 ordinary shares of £1 each. The ordinary shares were issued at a premium of 5s. 6d. each and the total has been carried to reserve.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

We have received particulars of the board's proposals with regard to the capitalisation of the company's reserves in accordance with the terms of the London Electricity (No. 2) Act, of 1925. The matter is of particular interest, being the first of its kind. It is the intention of the board to capitalise £189,000 of the company's reserves and to distribute this new capital to the ordinary shareholders in the proportion of £9 to each £5 already held. To facilitate this distribution it is proposed to divide each of the existing ordinary shares into five shares of the nominal value of £1. The capital of the company after the issue of the new shares will be £500,000. An extraordinary meeting was to be held yesterday to pass the necessary resolution to give effect to the scheme.

The "Sidro" Concern.—The *Financial Times* reports that at the annual meeting of the Société Internationale d'Energie Hydro-Electrique ("Sidro") in Brussels last week, the chairman was asked questions regarding the proposed international power utility trust. He said that the company had not acquired a single share of the Brazilian Traction Co., and it had nothing to do with the plans in contemplation or with the project itself. The company had received certain proposals from the new Canadian trust, but these were merely an indication of a basis for discussion. The decision with regard to any such matter lay with the shareholders.

Swiss Company.—The *Société pour l'Entreprises Electriques Motor Columbus*, Baden, reports a net profit of 6,530,000 Swiss francs for the last financial year, as compared with 5,850,000 fr. in 1924-25. The dividend is being increased from 9 to 10 per cent. on a capital of £2,400,000.

Westminster Electric Supply Corporation, Ltd.—As a preliminary to the capitalisation of the reserves the directors are converting £250,000 unissued preference shares into ordinary shares. A meeting is to be held on October 20th to confirm this.

Indian Companies.—*Tata Hydro-Electric Power Supply Co.*—The revenue for the year ended June 30th last amounted to Rs.45,83,636, and the net profit was Rs.20,37,626, as compared with Rs.22,24,053 in 1924-25.

Andhra Valley Power Supply Co.—The accounts for the year ended June 30th last show a revenue of Rs.60,83,450, and a net profit of Rs.9,94,845, as against Rs.14,28,011 in the preceding year.

Prospectus.—*Midland Counties Electric Supply Co., Ltd.*—The list opened on Wednesday last and was to close on or before to-day (Friday) in an issue by this company of 250,000 six per cent. cumulative preference shares and 250,000 ordinary shares of £1 each at par. This represents the balance of the capital authorised but hitherto unissued. The proceeds of the issue are to be utilised in paying off a bank loan and in providing further extensions to plant and mains already authorised.

Montreal Tramways Co.—It is reported that the issue has been authorised of $1,000,000 par value of common shares at the price of $125 per share to existing shareholders, ranking for the dividend in respect of the quarter ending March 31st, 1927. Special facilities have been arranged for European shareholders.

Montreal Light, Heat and Power Consolidated.—The company intends to redeem on November 1st all the preferred shares at par ($50) with accrued interest. Holders of $100 par value shares have been notified that their share-warrants should be changed at once for registered stock.

Anglo-American Telegraph Co., Ltd.—Dividends of 15s. per cent. on the ordinary stock and 30s. per cent. on the preferred stock have been declared in respect of the quarter ended September 30th.

Montevideo Telephone Co., Ltd.—The directors recommend a final dividend of 5 per cent., free of tax; the interim distribution was 3 per cent., less tax. In the previous year the total dividend was 7 per cent., less tax.

Cuba Submarine Telegraph Co., Ltd.—An interim dividend of 2½ per cent., free of tax, has been declared on the ordinary shares, as in 1925.

Manaos Tramways and Light Co., Ltd.—The directors have decided to pay 3½ per cent. interest on the 7 per cent. participating first debentures.

Oriental Telephone and Electric Co., Ltd.—An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares.

Yates & Thom, Ltd.—A dividend of 5 per cent. is being paid out of a net profit of £5,238. Last year's net profit was £10,302, and the dividend was 10 per cent.

Hankow Light and Power Co., Ltd.—A final dividend at the rate of 15 per cent. on the ordinary shares and a dividend of 30s. per share on the deferred shares are announced.

Callender's Cable and Construction Co., Ltd.—An interim dividend of 5 per cent. has been declared on the ordinary shares. The same rate was paid last year on a smaller capital.

Calcutta Electric Supply Corporation, Ltd.—An interim dividend of 5 per cent. (less tax at 2s. in the £) has been declared on the ordinary shares, as in 1925.

Sir W. G. Armstrong, Whitworth & Co., Ltd.—The directors have decided to make no interim distribution upon the 4 per cent. first cumulative preference shares.

Babcock & Wilcox, Ltd.—The interim ordinary dividend is again 5 per cent., free of tax.

Stocks and Shares.

Monday Evening.

It must be many years since the London electricity supply market has been the centre of so much excitement as it has been during the past few business days. The Kensington and Knightsbridge Company started the enthusiasm by issuing a circular to its shareholders, in which the capitalisation of reserves, and their distribution, were proposed. Each £5 share is to receive, under the directors' scheme, £9 from the reserve, and, when this is done, the whole £14 is to be divided into 14 shares of £1 each. The announcement outran the hopes of all the optimists. Kensingtons rose no less than 65s. per share. St. James's gained 32s. 6d., and the various £1 shares—Charing Cross, Chelsea, County of London, Westminsters, and the others—show rises ranging from 1/16 to 6s. 9d., the latter being the advance in County ordinary. The market became almost numb as a first result of the Kensington announcement. Then, as prices started to go ahead, a few selling orders came in, and, the market being more liberally supplied, it was more easy to deal. Activity developed as some of the holders deemed it discreet to take advantage of the boomlet. The daily turnover of shares is on a large scale, and interest stands on the *qui vive* as to which will be the next company to declare its intentions. The Westminster Electric statement was thought likely to come at any moment.

The capitalisation is applied, of course, to reserves, and reserves are, as a general rule, accumulated out of profits. These belong to holders of ordinary shares, and there is, accordingly, no question of preference shares possessing any claim to participation in this process of cutting the melon.

Midland Counties ordinary shares are easier upon the pending issue of half a million pounds new capital, to be equally divided between ordinary and preference shares of £1 each. Bournemouth and Poole ordinary have been changing hands up to 62s. on very persistent reports that the long-rumoured offer for the purchase of the undertaking by the Bournemouth Corporation is on the point of being made public.

Brazilian Tractions have dropped 10¼ to 112, and the 6 per cent. preferred are flat at 109 on heavy sales said to be caused by the decline in the value of the milreis. Brussels has turned round and, from being an avid buyer, has been a pressing seller. Sidros, in spite of the board having been strengthened by the appointment of two additional directors, went back to 11¼. Barcelona Tractions remained tolerably steady. It may be wondered whether the decline in the milreis is the sole reason for so dramatic a drop in Brazilian Tractions.

South London traffic is the despair of those alike who are part of it, and those who endeavour to meet its needs. More Tubes are imperatively required, in the view of the people affected by the problem, and it seems ironical to read, simultaneously, that the L.C.C. tramways ran at a loss of £150,000 in the six months that ended with September. Underground Railway issues are heavy and uninteresting. Districts and "Mets." have gone back. The £10 shares of the Underground Electric Railways are offered at 4. In the colonial and foreign group, British Columbia deferred has risen 2 to 142; Anglo-Argentine second preference at 2¾ are 1/16 up, while the 5 per cent. debenture at 75 is a point to the bad.

Automatic Telephones are good at 55s. and, in the cable group, Globe ordinary and preference show small improvements. On the other hand, Westerns weakened to 18¼.

English Electrics have gone back to 14s. 6d., and India Rubber shares to 21s. 3d. Marconis are a heavy market again at 13s. 9d. sellers. Canadian Marconi went back to 3s. 3d. The influence of the continued coal stoppage makes itself felt in the iron, coal and steel market, as well as in other industrial sections. Rubber shares have been assisted by a slight rally in the price of the raw product. Business runs on a quiet scale, taking the Stock Exchange as a whole. The outstanding feature of strength is supplied by the market for electricity supply shares, upon which the guns of academic caution are trained with praiseworthy attention.

Share List of Electrical Companies.

	Nom. £	Dividend. 1924.	Dividend. 1925.	Price Oct. 11 1926.	Rise or fall.	Yield p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	14	14	59/6	+1/6	4 14 1
Brompton Ordinary	1	10	10	1 5/8	—	5 12 2
Charing Cross Ordinary	1	15	15	2 7/16	+4/3	6 8 1
do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	2¼	+¼	5 12 11
City of London	1	15	15	41/6	—	6 1 3
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	27/-	—	5 18 6
County of London	1	15	15	3¼	+6/9	4 18 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	8	1 1/2	+1.6	5 16 5
do. 7% Pref.	1	6	7	22/6	—	6 4 5
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	15	15	17	+3½	4 8 3
Lancs. Light and Power	1	7½	7½	24/-	—	6 5 0
London Electric	1	10	10	35/-	+3/-	5 14 3
do. do. 6% Pref.	5	6	6	5 3/4	—	5 11 7
Metropolitan	1	11	11	42/-	+5/-	5 0 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	20/6	−6d.	5 17 1
Newcastle-on-Tyne Ordinary	1	7	7	21/3	—	6 11 9
do. 5% Pref.	1	5	5	17/6	—	5 14 3
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	18	+1¾	4 17 3
South London	1	15	15	2 13/16	+1/16	*5 6 8
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	7	1¼	+1/16	5 12 0
do. 6% Pref.	1	6	6	21/-	—	5 14 3
Westminster Ordinary	1	15	15	2½	+¼	6 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/6	—	7 6 4
Yorkshire Elec.	1	8	8	27/-	—	5 18 6
Home Rails.						
Central London Ord. Assented	Stock	4	4	69	—	5 15 11
Metropolitan	,,	5	5	61	−1	8 4 0
do. District	,,	3½	3½	52½	−½	6 13 4
Underground Electric Ordinary	10	Nil	Nil	4	—	Nil
do. do. "A"	1/-	Nil	Nil	12/-	—	Nil
do. do. Income	Bonds	6	6	101	—	*5 18 10
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	24¾	—	6 1 3
Automatic Telephone	1	8	10	2 3/8	+1/16	3 13 9
Chili Telephone	5	5	6	6¾	—	4 7 4
Cuba Sub. Ord.	10	5	5	7½	—	6 18 0
Eastern Extension	10	10	10	19½	—	*5 4 8
Eastern Tel. Ord.	Stock	10	10	190½	—	*5 5 0
Globe Tel. and T. Ord.	10	10	10	19⅝	+⅛	*5 1 11
do. do. Pref.	10	6	6	11¼	+⅛	5 7 10
Great Northern Tel.	10	22	20	27½	—	7 5 6
Indo-European	25	8½	10	47½	—	*5 5 0
Marconi	1	10	Nil	13/9	—	... ...
Marconi-Marine	1	10	7½	20/-	—	7 10 0
Oriental Telephone Ord.	1	12	12	46/3	—	*5 3 10
United R. Plate Tel.	5	8	8	8⅝	—	*4 15 7
Western Telegraph	10	10	10	18½	−¼	*5 8 1
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	8	—	9 3 4
do. do. 2nd Pref.	5	6	6	9⅞	+1/16	10 18 2
do. do. 5% Deb.	Stock	5	5	75	−1	6 13 4
British Electric Traction Ord.	,,	7	8	140	—	5 14 4
do. do. 6% Pref.	,,	6	6	110	—	5 9 1
Brazil Traction	100	4	5	112	−10¼	4 10 0
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	86½	—	5 15 7
do. do. Preferred	,,	96/-	126/9	113½	—	*5 12 8
do. do. Deferred	,,	129/5	8	142	+2	*5 12 8
do. do. Deb.	,,	4½	4½	77½	—	5 7 7
London & Sub. Trac. 5% Pref.	1	2½	Nil	5/4	—	Nil
London United Tram. Deb.	Stock	4	4	44½	—	8 19 10
Mexico Trams, 5% Bonds	—	5	5	65½	−1	7 12 8
Mexican Light Common	100	Nil	Nil	34	—	Nil
do. Pref.	100	Nil	Nil	85½	—	Nil
do. 1st Bonds	—	5	5	70	—	7 2 10
Yorkshire (West Riding)	1	5	—	11/6	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	1	12	13	2 1/4	—	4 16 9
British Aluminium Ord.	1	5	10	46/3xd	—	4 6 8
British Elec. Transformer Pref.	1	Nil	7	18/3	—	7 13 5
British Insulated Ord.	1	15	15	3½	—	4 5 9
Brush Ord.	1	10	10	27/-	—	7 8 2
Callenders	1	15	15	3¾	—	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	13/3	—	... ...
Edison-Swan	4/-	10	10	12/9	—	3 2 7
do. 5% Deb.	Stock	5	5	86	—	5 16 3
Electric Construction	1	10	10	31/9	—	6 6 0
Enfield Cable Pref.	1	7½	7½	1¼	—	6 6 4
English Electric	1	5	Nil	14/6	−1/-	... ...
do. do. Pref.	1	6	6	17/6	—	6 17 3
Gen. Elec. Pref.	1	6½	6½	2 1/-	—	5 13 1
do. Ord.	1	5	7½	30/3	—	4 19 2
Henley	1	16	20	4¼	—	4 16 10
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1 1/16	−1/9	*4 14 1
Johnson & Phillips	1	10	17½	66/3	—	5 5 8
Met.-Vickers Ord.	1	8	8	25/9	—	6 4 9
do. Pref.	2	8	8	2¾	—	6 14 9
Siemens Ord.	1	7½	7½	1¾	—	5 9 9
Telegraph Construction	12	20	10	30	—	*4 9 9

*Dividends paid free of Income Tax.

Electrical Imports and Exports of Japan.

The following statement shows the import and export trade of Japan in 1921 and 1924, in electrical and similar goods. These are the first statistics which have been made available in any detail since the earthquake. Owing to the destruction of records during that disaster no complete figures for 1922 or 1923 are available for purposes of comparison.

Imports.

	1921. Yen.	1924. Yen.
Submarine telegraph or telephone cable		
(all from Great Britain) ...	1,711,000	736,000
Other insulated electric wires—		
Total	156,000	716,000
From United States	147,000	165,000
,, United Kingdom	4,000	118,000
,, Germany	*	429,000
Steam turbines—		
Total	2,292,000	2,297,000
From United States	1,870,000	1,047,000
,, United Kingdom	—	567,000
,, Germany	159,000	53,000
,, Sweden	195,000	118,000
,, Switzerland	*	510,000
Parts of steam turbines—		
Total	824,000	619,000
From United Kingdom	183,000	47,000
,, Sweden	182,000	25,000
,, United States	454,000	473,000
,, Switzerland	—	55,000
Gas engines and internal combustion motors—		
Total	1,111,000	5,571,000
From United Kingdom	199,000	885,000
,, Sweden	32,000	232,000
,, United States	747,000	3,052,000
,, Germany	94,000	430,000
,, Switzerland	*	461,000
Steam engines—		
Total	391,000	31,000
From United Kingdom	286,000	14,000
,, United States	65,000	8,000
,, Belgium	38,000	—
,, Germany	—	5,000
Steam boilers and parts—		
Total	7,605,000	5,472,000
From Switzerland	*	276,000
,, United Kingdom	5,117,000	3,926,000
,, United States	2,226,000	1,115,000
Dynamos, motors, transformers, &c.—		
Total	9,664,000	20,978,000
From France	21,000	134,000
,, United Kingdom	758,000	1,671,000
,, Sweden	206,000	16,000
,, United States	8,047,000	15,522,000
,, Switzerland	17,000	782,000
,, Germany	546,000	2,821,000
Dynamos combined with motive machinery—		
Total	640,000	367,000
From United Kingdom	80,000	59,000
,, United States	503,000	90,000
,, Germany	—	91,000
,, Switzerland	55,000	46,000
,, Denmark	—	72,000
Telegraphic and telephonic instruments and parts—		
Total	882,000	4,338,000
From United Kingdom	28,000	1,126,000
,, France	—	103,000
,, Denmark	3,000	24,000
,, United States	847,000	2,712,000
Water turbines and Pelton wheels—		
Total	1,600,000	1,463,000
From United Kingdom	374,000	130,000
,, France	84,000	79,000
,, Switzerland	554,000	724,000
,, Sweden	465,000	167,000
,, United States	102,000	50,000
Lamps, lanterns and parts—		
Total	537,000	903,000
From United Kingdom	60,000	179,000
,, United States	372,000	426,000
,, Germany	*	270,000
Wattmeters—		
Total	550,000	3,868,000
From United Kingdom	2,000	199,000
,, Germany	227,000	1,983,000
,, United States	251,000	564,000
,, France	62,000	183,000
,, Switzerland	*	598,000
Other meters—		
Total	2,335,000	4,792,000
From United Kingdom	419,000	2,164,000
,, United States	998,000	1,204,000
,, Germany	852,000	1,218,000
Carbon for electrical use—		
Total	258,000	606,000
From United Kingdom	41,000	97,000
,, Germany	37,000	89,000
,, United States	176,000	376,000

Exports.

Electrical machinery and parts thereof—		
Total	3,084,000	1,754,000
To China	1,372,000	501,000
,, Kwantung Province	942,000	786,000
,, Hong Kong	119,000	124,000
,, British India	22,000	55,000
,, Straits Settlements	134,000	21,000
,, Dutch India	—	14,000
,, French Indo-China	7,000	—
,, Asiatic Russia	26,000	6,000
,, Philippine Islands	8,000	4,000
,, Siam	110,000	3,000
,, France	13,000	2,000
,, United States	4,000	63,000
,, Chile	22,000	—
,, Argentina	—	1,000
,, Egypt	6,000	—
,, Cape Colony and Natal ...	177,000	—
,, Australia	31,000	166,000
,, New Zealand	*	1,000
Telephones and parts thereof—		
Total	118,000	143,000
To China	37,000	32,000
,, Kwantung Province	76,000	101,000
,, Great Britain	*	7,000
,, Straits Settlements	1,000	—
,, Asiatic Russia	*	1,000
Electric lamps—		
Total	1,027,000	1,829,000
To China	139,000	64,000
,, Kwantung Province	266,000	339,000
,, Hong Kong	51,000	27,000
,, British India	13,000	10,000
,, Straits Settlements	2,000	8,000
,, Dutch India	5,000	5,000
,, French Indo-China	1,000	—
,, Asiatic Russia	2,000	2,000
,, Siam	13,000	—
,, United Kingdom	2,000	4,000
,, France	9,000	—
,, United States	362,000	1,251,000
,, Canada	89,000	100,000
,, Peru	2,000	—
,, Chile	1,000	—
,, Argentina	1,000	5,000
,, Egypt	1,000	—
,, Australia	2,000	—
,, Philippine Islands	49,000	4,000
Insulated electric wire—		
Total	3,273,000	1,372,000
To China	1,518,000	316,000
,, Kwantung Province	1,111,000	888,000
,, Hong Kong	129,000	91,000
,, British India	57,000	—
,, Straits Settlements	9,000	—
,, Dutch India	287,000	4,000
,, French Indo-China	2,000	—
,, Asiatic Russia	9,000	8,000
,, Philippine Islands	18,000	—
,, Siam	41,000	55,000
,, United Kingdom	1,000	—
,, United States	10,000	3,000
,, Chile	10,000	—
,, Argentina	—	1,000
,, Egypt	7,000	—
,, Australia	7,000	—
,, New Zealand	2,000	—
Steam boilers and parts—		
Total	591,000	99,000
To China	266,000	38,000
,, Kwantung Province	292,000	60,000

* Not specified.

It is possible to give a few comparative figures for 1925 and 1924, *i.e.*, of the totals of the principal groups. They are set out below together with a note of increases or decreases :—

Exports.

	1924. Yen.	1925. Yen	Inc. or dec. (Thous.)
Insulated electric wire—			
Total	1,373	1,774	+ 401
To China	317	578	+ 261
„ Kwantung	889	688	− 201
„ Hong Kong	91	74	− 17
Electrical machinery—			
Total	1,755	2,132	+ 377
Telephones—			
Total	143	354	+ 211
Electric lamps—			
Total	1,829	2,222	+ 393

Imports.

Submarine telegraphic or telephonic cables	736	1,503	+ 767
Other insulated electric wire ...	717	968	+ 251
Wattmeters	3,868	2,270	− 1,598
Telegraphic or telephonic instruments and parts	4,338	16,924	+12,586
Steam boilers and parts ...	5,473	5,839	+ 366
Steam turbines	2,298	1,452	− 846
Steam engines	32	60	+ 28
Water turbines	1,463	773	− 690
Dynamos, motors, transformers, &c.	20,978	11,981	− 8,997
Dynamo sets	368	901	+ 533
Electric carbons	606	794	+ 188

Kiosk-Type Sub-Stations.

An Interesting Installation on a 6.6-kV Ring Main.

The heavy capital cost involved in building and equipping sub-stations of the conventional type often renders loads which should be a source of profit to the supply authority unremunerative, and a solution of the problem has in some cases been found in the outdoor-kiosk type of station. An interesting example is that designed by Messrs. Ferguson, Pailin, Ltd., in conjunction with the engineers of the Stretford U.D.C. Electricity Department, and installed in an outlying part of the Stretford system. This kiosk is constructed on a rigid angle-iron framework embedded in a concrete foundation raft, the framework being covered in with heavy-gauge boiler-plate sheets. The concrete floor inside is flush with the top of the base irons, thus facilitating removal of the transformers and switchgear, and rendering the ingress of water impossible

Fig. 1.—Kiosk Sub-station showing e.h.p. Switchgear and Transformer Compartments.

under normal conditions. Four separate compartments are provided, capable of accommodating two 250-kVA oil-immersed self-cooled Ferranti transformers and the necessary e.h.p. and l.p. switchgear. Double doors at each end of the kiosk give access to the central (side to side) transformer compartments, and the doors for the switch compartments at the side are hinged horizontally and are divided into two sections, fig. 1. The upper half lifts up and forms a sloping roof to protect the operator from bad weather, hooks being provided on the underside to enable fitted waterproof sheets to be adjusted rapidly for additional shelter. The lower halves of the doors are specially strengthened and arranged to drop down so as to form a working platform. The doors to the l.p. switch compartment, fig. 2, are covered with rubber matting. To guard against corrosion all the exposed metalwork is treated with bitumastic composition, and lantern louvres afford adequate ventilation to the interior. E.h.p. switchgear of the metal-clad oil-filled type is incorporated, fig. 1, and the transformers are controlled by two Ferguson & Pailin "DV"-type single-busbar units. These are hand-operated and each fitted with the required metering equipment. The gear is mounted against one of the interior division walls, and the outgoing connections consist of bare conductors passing through bakelite bushes into the transformer chamber.

This sub-station is installed on a 6.6-kV ring main and, as it was not desired to employ oil circuit breakers on the ring

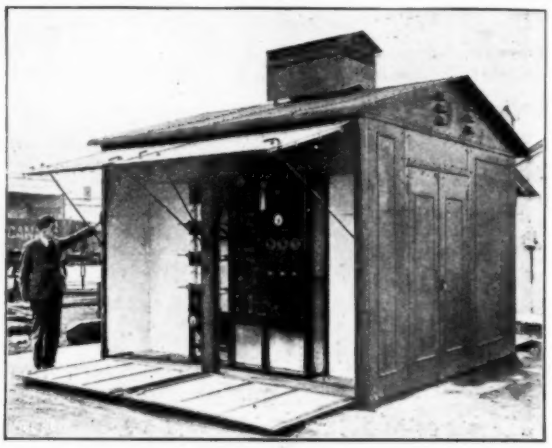


Fig. 2.—L.p. Switchgear Compartment.

main feeders, special arrangements have been made for their control. At each end of the switchboard an isolating switch chamber accommodates a triple-pole oil-immersed quick-break isolating switch. This is mechanically operated from the front of the unit by means of a detachable handle and disconnects the ring main feeder from the busbars. A further movement of the handle earths the feeder, the earthing contacts being arranged so that the centre phase is earthed in advance of the other two phases. The operating gear may be locked in the "on," "off," or "earthed" positions, and test terminals are provided on the isolator box to enable cable tests to be carried out.

The l.p. supply from the transformers is brought to the busbars through two triple-pole knife switches mounted on a slate panel and then distributed through pillar-type fuse units, nine of which can be accommodated. The standard Stretford earth-testing arrangements and provided, and consist of a 4-ohm earthing resistance with short-circuiting circuit breaker, ammeter and 4-way change-over switch, together with indicating lamps and fuses.

A Kaplan Turbine Installation.

In order to meet the increasing demand for power at its factory the Steyermuhl Paper Manufacturing Co., of Siebenbrunn, Austria, has recently completed a hydro-electric power plant on the river Traun. The head ranges between 17 ft. 9 in. and 20 ft. 6 in., and the maximum amount of water available is about 11,000 gallons per second. Up to recent times Francis-type turbines were mainly used for such installations, either of the vertical type with bevel gearing, or multi-wheel turbines with horizontal spindle. Even with spiral bevel gearing it is not an easy task to secure silent running, while there is also a loss of efficiency in the transmission. Multiple-wheel turbines are also costly to install because of the special inlet chamber and discharge pipes they require. In the end it was decided to install three Kaplan turbines and generators as being the best suited to meet the requirements of a plant such as that at Siebenbrunn, where long periods have to be run with a minimum water supply. The three turbines, which were constructed by the J. M. Voith Co., are designed to develop 925 h.p. each with a head of 17 ft. 9 in. and a supply of about 3,630 gallons per second. With a head of 20 ft. 6 in. the power developed per turbine is increased to 1,100 h.p. The turbines run at 250 revs. per min., a speed which permitted the use of vertical-spindle alternators of a less costly design than would otherwise have been necessary. The turbines are located in a spiral-shaped cement chamber below the level of the alternator room, in which the turbine control gear is arranged.

The propellers in this installation have an outside diameter of 6 ft. 3 in., the central hub being of cast iron and the blades of special bronze. The pivots of the blades are mounted within the hub, the blade adjustment being controlled by a rod located within the hollow spindle of the turbine.

The turbine spindle runs in two guide bearings, one in the upper part of the turbine casing and one supported on a

cast-iron cross member. A flywheel is mounted between the turbine and alternator in order to prevent any shock on the generator resulting from variations in the water admitted to the turbine.

The weight of the rotating part of each set and the pressure of the water—a total of about 40 tons—is carried by a segment bearing with forced lubrication, mounted in a cross-head above the alternator. The heated oil is pumped through a cooler and filter and thence back to the bearing. As the lubrication can only be efficiently maintained when the oil pump is working at a certain minimum speed, long running of the alternator below the safe minimum is prevented by quickly bringing it to a stop by means of brake shoes acting on the under-side of the flywheel rim.

Owing to the high rate of rotation of Kaplan turbines, the water emerges therefrom at a high speed; consequently special attention has to be paid to the design of the outlet piping. This was particularly the case in the Siebenbrunn installation, where, owing to local conditions, the turbines had to be located at a relatively great height above the water in the tail-race.

When the acceptance tests were carried out the guaranteed efficiencies of the turbines were exceeded by a considerable

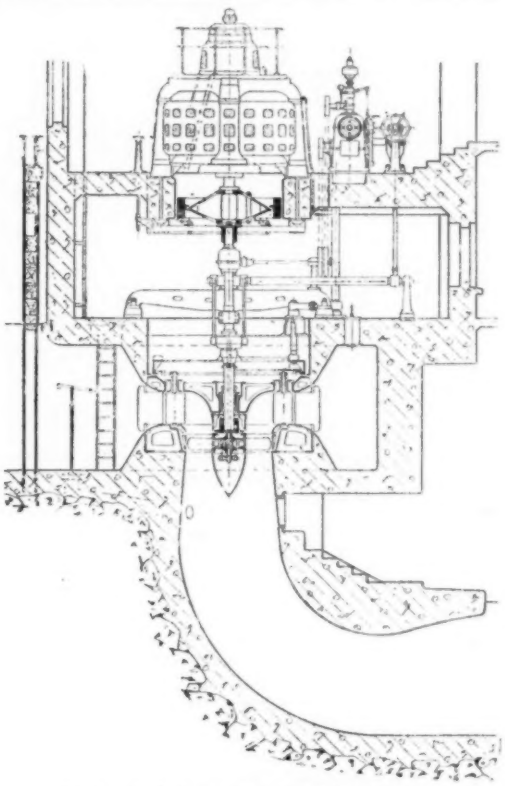


Fig. 1.—A Kaplan Turbine Installation in Austria.

margin, 80 per cent. being attained with a delivery of 1,210 gallons per sec., 87.5 per cent. with 1,980 gallons, and 87 per cent. with 2,640 gallons, as against the guarantee of 81 per cent., and 85 per cent. with 3,520 gallons. It is stated that the plant since it was started has run with every satisfaction, and has maintained the efficiencies recorded in the tests.

Canadian Water-Power Agreement.—The Toronto correspondent of *The Times* says that it is understood that an agreement has been reached between the Governments of Quebec and Ontario under which the export to the United States of the power developed at the Carillon Falls on the Ottawa River will be prohibited, and the energy will be divided between the two Provinces. A contract will be submitted at the next Session of the Quebec Legislature under which the Carillon development will be carried out by a private company, but under conditions which will provide a substantial revenue for both Provinces. The contract with the National Hydro-Electric Company for the development of power at Carillon will cover 75 years, and the company will be required to expend $40,000,000. The company will pay the Province of Quebec a yearly rental of $25,000, and a water rental of 50 c. per h.p. The power to be supplied to Ontario under the agreement is to be distributed by the Ontario hydro-electric system. The Dominion Government has cancelled a lease between the Department of Railways and a private company which gave the company the right to develop power at Carillon. Thus a dispute between the Provinces and the Dominion was averted, and the Provincial Governments were left free to make the agreement which has just been completed.

Research in Ventilation.

Advantages of Electrical Circulation and Heating of Air.

Some interesting and illuminating data, based on the results of the investigations by Dr. H. M. Vernon and other members of the Industrial Fatigue Research Board on the subject of ventilation, have been crystallised in a special report published by H.M. Stationery Office, and although many of the data are highly technical, the report merits the perusal of all who are interested in and concerned with the employment of operatives. It is made abundantly clear that the scientific ventilation of all sorts of buildings is a subject which demands more earnest attention than has been given to it in the past. The report ruthlessly condemns the prevalent fallacy that ill-effects of bad ventilation result solely from the chemical impurity of air, and asserts with emphasis that these ill-effects are primarily due to the want of adequate cooling of the body and evaporation from it.

The publication is in four parts; the first deals with two new instruments designed by Dr. Vernon and Mr. J. J. Manley for the measurement of variations in the velocity and in the temperature of air currents. The second part gives further calibrations of the Kata-thermometer, an instrument designed for the measurent of its own rate of cooling when the temperature approximates that of the human body, and part three consists of a *résumé* of investigations carried out with the object of finding how far the objective indicators of the Kata-thermometer correspond with actual sensations of comfort.

In the fourth part of the report Dr. Vernon sets down his records of study of the rate of cooling of the human body, and throws further light on the relative importance of air temperature, clothing, and air movements. The dissemination of the wider knowledge thrown on problems of ventilation by the report as a whole is a mission which the electrical trade can undertake with advantage, and it is interesting to note that the General Electric Co., Ltd., contributed materially towards the success of the experiments on air movement cited in the report, in which a "Magnet" Gyro-type fan was used.

On the subject of fans, the experts give details of a number of experiments conducted by means of this 16-in. electric fan, which was driven at varying speeds. The investigators determined the cooling power of the air, and measured its oscillations in velocity and temperature. Some 229 observations were made in summer time and 203 in winter, and the mean results indicate that to produce a given sensation of air movement in winter requires a cooling power slightly higher than that required in summer. It was found that the various degrees of "stagnancy" experienced in factory air were due entirely to differences in the air temperature, while the varying degrees of "freshness" were due chiefly to differences in air velocity. From these observations it is clear that electric fans should be looked upon less as apparatus designed for cooling purposes, but rather as media for increasing the oscillations of air velocity in the interests of both health and comfort. The electric fan with high volumetric efficiency undoubtedly serves its purpose in performing the function of air movement which this conception of effective ventilation involves, particularly so in the case of fans possessing oscillating and "Gyro" mechanism, operative during motion over a considerable range, such as was incorporated in the fan used in the experiments.

There are other factors also to which the electrical trade can apply itself. One of these is heating, which cannot be divorced from any scheme of ventilation. The investigators lay stress upon the fact that systems of heating should involve surfaces of fairly low temperature disposed as near to the floor as possible, and if practicable, below the floor level. In accordance with thermostatic principles, a convolution of currents must always result through warm air rising at the floor level and cold air descending from the upper levels. There is in the report also an intimation that electrical heating systems are highly efficient, and they must be the most satisfactory from the point of view of health, preventing the vitiation of the atmosphere and reducing carbon-dioxide emanations.

From the clear-cut views expressed by the experts concerned, it is impossible to deduce any other conclusion than that by a combination of electric fans for air movement and electric radiators for warming purposes, we approach nearer to the ideal for factory and workshop ventilation and heating than can possibly be contrived by any alternative means.

Improved Efficiency and Coal Consumption.—From figures published by the United States Geological Survey the *Electrical World* educes the fact that improvements in the efficiency of electrical generating plant since 1919 caused a saving of nearly 75,000,000 tons of coal up to the end of 1925.

The "Seelco" Wiring System.

The Siemens & English Electric Lamp Co.'s Method.

In order to meet the requirements of an inexpensive method of cabling an electric service, which shall at the same time be convenient to install and efficient in that it can be adequately bonded and earthed without involving undue labour, a number of special wiring systems have been introduced

Fig. 1.—"Butterfly" Clip and 3-core Cable.

from time to time. Amongst them is the "Seelco" system of the Siemens & English Electric Lamp Co., Ltd., the accessories of which have been designed to afford simplicity and ease of manipulation, enabling an installation to be carried out expeditiously and in a neat and workmanlike manner.

Fig. 2.—Single-core Cable "Cushion" Clip.

The cable employed is of the 600-megohm "Nonazo" class, the tinned-copper conductors being rubber insulated and each core distinctly taped; the required number of cores are placed side by side and sheathed with a seamless tube of lead-alloy composition, so that twin- and three-core cable is flat and single-core cable circular in section.

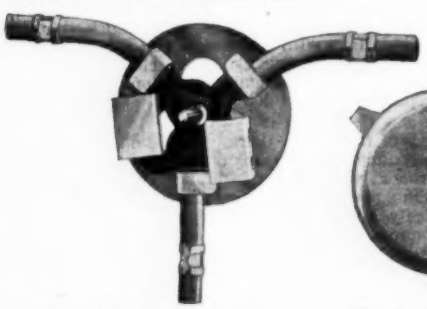


Fig. 3.—Tee Joint Box with Cover Removed.

Fig. 4.—Steel Junction Box Cover.

For fixing internal surface wiring "buckle" clips, secured by nails or wood screws, are recommended, but in damp situations, or where greater mechanical strength is needed, "butterfly" clips made of heavier metal are more appropriate; also fixed by nails or screws, their tongues are bent over the

Fig. 5.—Fuseboard Bonding Bar and Clamps.

cable, as indicated in fig. 1, by hand and finished by tapping with a light hammer. For rapid erection in such places as over a picture rail and under floors, &c., "cushion" clips are especially suitable; fig. 2 shows the method of securing a single-core cable. The use of "Rawlplugs" will ensure that the fixing screws will hold securely.

Special attention has been devoted to the manner of bonding the cable, which is effected by simple clamps, few in number, that should prove to be reliable in use. In order to obtain electrical continuity of the sheathing of the wire for earthing purposes a set of accessories has been provided; a backplate with a central screw, nut and countersunk head, together with three types of phosphor-bronze clamps (single and twin side entry, and back entry) which should allow of almost any combination that may be found necessary.

The accompanying illustrations show how a tee junction box is assembled (fig. 3) with the aid of a backplate, three clamps, two porcelain connectors, and a steel cover; it will be noticed that the method enables the cables to enter at any position, the cover being cut and the tongues bent out as shown (fig. 4). At switch and lamp points the accessories are covered with a wood block with a recessed back, which is secured by means of the countersunk-head nut through a centre hole.

When a number of cables have to be bonded, as in the case of a main distribution point, or fuseboard, the bonding bar depicted in fig. 5 should be used; it is supplied fitted with a special clamp designed to accommodate any size of twin sub-main cable from 1/.044 to 7/.064, which is accomplished by utilising the complete clamp for the smaller sizes, while its inner part is removed and bonding is effected by the outer band only when the larger sizes of cable are used. Only one size of bar is supplied, as several of them can be coupled together if required.

Notes from Canada.

[From Our Own Correspondent.]

In a recent issue of the *Canadian Engineer* figures were taken from other sources indicating that the capital expenditure required for hydro-electric development during the next 20 years in Eastern Canada alone will average nearly $65,000,000 per annum, totalling about $1,300,000,000 for the period, of which $600,000,000 will be required in Ontario and nearly $700,000,000 in Quebec. The area considered in making these estimates is said to extend northwards, towards the mouth of the St. Lawrence river, nearly 200 miles beyond the Saguenay river, and includes the Manicaugan river; westward it includes the mining districts of Cobalt and Sudbury, and southward it includes the whole of the Niagara peninsula. Anyone who cares to look up a map of this region will get some idea of its enormous extent.

Business in Canada generally seems to be definitely improving, and in large electrical equipment for hydro-electric development, mining and pulp and paper work there seems to be great activity—this statement must not be interpreted as meaning that there is work for all and sundry electrical men who are looking overseas if they come over to Canada, especially at the approach of winter, which usually proves none too easy for newcomers, owing to the severe weather, which requires that extra warm clothing and plenty of it be available, and much fuel must be paid for either directly or indirectly. Lack of these two essentials in reasonable amount means real hardship, of which there is quite sufficient evidence every winter, especially in the large cities, where the outdoor workers from the woods and elsewhere usually congregate at that period hoping to obtain employment of some kind.

The Hydro-Electric Power Commission of Ontario is making a trial of bronze runners in some of the large hydraulic turbines at the Queenston generating station at Niagara Falls owing to trouble having been experienced with steel runners due to cavitation.

Following its policy of having direct inter-communication between the head office in Toronto and all its generating and transformer stations by means of an automatic telephone system the Commission has recently established short wave radio communication between Toronto and its farthest generating station at Nipigon, some 700 miles away.

While on the subject of radio communication, it may be stated that the Dominion Government is said to be arranging for the establishment of three transmitting stations in the Far North-West at points which previously have been isolated from the rest of the world for months at a time. What this change will mean to the lonely dwellers in those chilly and remote regions may be imagined.

It is reported from Montreal that consideration is being given by the Montreal Tramways Co. to a scheme for constructing elevated high-speed tramways to connect the Place d'Armes with the north end of the city.

The Toronto Transportation Commission, a civic body which controls the street-car (tramway) service of the city has recently introduced an idea that is new in Canada, though apparently it is not unknown in the United States. Owing to the tremendous peak load and demand for extra cars at the times of opening and closing of the business places the Commission is endeavouring to persuade some of the business firms to open and close their premises at times other than the usual ones, and it has set the example recently by opening and closing its offices half-an-hour earlier than previously. The *Canadian Engineer* states that the morning peak requires 2.4, and the evening peak 2.9 times as many cars as the base load; many of the peak load cars make only one trip in the morning and one in the evening, and about 145 cars make only one trip per day for five days a week, the empty return movement producing hardly any revenue.

The Birmingham and Midlands Wireless Exhibition.

Notes on some of the Exhibits.

The Birmingham and Midlands Wireless Exhibition is the first radio-apparatus show to be held in Birmingham. In this respect Birmingham has lagged behind other important provincial centres, although the industry has grown enormously in the city, till it now occupies a position second only to London. This Exhibition, however, makes good the deficiency, for it is a comprehensive show of what local manufacturers and traders are doing, while well-known national firms also are well represented. It comes at an opportune time, too, and coincides with a marked increase of interest in wireless in the Midlands, which in Birmingham necessitated the augmentation early in the month of the staff at the city's head Post Office, which deals with wireless licences.

The Exhibition serves to emphasise, perhaps a little more distinctly than did the recent one at Olympia, London, by reason of the smaller display, the prevailing tendency of the industry in two important directions: first, the increasing search for simplicity, which is leading rapidly to the comparative perfection of the single-control receiver, a type of set almost unknown a year or so ago. This is, of course, an attempt to meet the growing demands of people who look upon the wireless receiver as a musical instrument first and foremost. To such people, the complicated array of tuning dials and switches with which the receiver of two years ago was burdened is anathema, and they have remained aloof from wireless until recently. That there are many people who will buy receivers now that they are becoming simpler is undoubtedly true, and the important thing for the trade is that it is not merely a matter of selling the sets, but of replenishment and "service" generally. The single-control receiver has the added virtue, as most of the sets at this Exhibtion showed, of lending itself much more readily to artistic cabinet work, in which the old, aggressively scientific, appearance is entirely lost and a harmonious blending with furniture schemes made easily possible. There are, indeed, many exhibits at Birmingham which reveal this quality in a pleasing degree, and some of them are shown to advantage by being placed against a background having more or less a home-like drawing-room appearance. The amount of interest shown in these sets is a sufficient indication of the demand for simplicity and artistic finish. The new sets of the G.E. Co., the Marconiphone Co., B.T.-H. Co., and A. J. Stevens, Ltd., are good examples of high craftsmanship and technical skill combined with simplicity, while amongst the receivers manufactured by Birmingham firms those of B.S.A. Radio, Ltd., S. A. Lamplugh, Ltd., and Wilkins & Wright, Ltd., are particularly noteworthy examples. Although B.S.A. Radio, Ltd., has not made so conspicuous a feature of the single-control device, its 2, 3, 4, and 7-valve receivers are designed with notable simplicity, mounted on sloping panels in tall cabinets, the valves, coils, and batteries being hidden from view. Such sets present no difficulty when harmony with furniture schemes is to be considered. The Lamplugh sets are smaller and are contained in cabinets of polished oak and mahogany. The single tuning device is a large condenser dial, geared in a high reduction ratio, which occupies a central position in a small sloping panel of decorative insulating material which tones well with the wood; a thin pointer moving over a finely engraved dial indicates the reading. In the case of the Wilkins & Wright instruments, the conventional ebonite panel is almost entirely dispensed with, the only ebonite used being the minimum consistent with reliable insulation. The ebonite consists, externally, of a small circular panel which is a background to the tuning dial, and beneath the dial is a switch which fulfils the three-fold purpose of switching on the set, and changing over from the local station to Daventry. Thus, the choice of two programmes is possible by the motion of this switch, and the more distant stations are tuned in by the condenser dial. This method of control is provided in sets employing three and four valves.

The introduction of the single tuning control method in large sets has been achieved generally by the use of double or triple-gang condensers, operated by one dial; not an entirely satisfactory method in some cases, as it imposes a strain upon the bearings and driving gear and is apt to increase the probability of "back-lash." Messrs. Wilkins & Wright show a combination of six condensers, however, driven on one shaft by a micrometer-tuning dial, in which the motion is of the epicyclic, friction-geared, type, transmitted through three small disks which engage with the main shaft; the motion is smooth and regular throughout, and back-lash, it is claimed, is eliminated.

An interesting receiver in which simplicity of control is conspicuous, is the one embodying the new "N" circuit of Sir Oliver Lodge, manufactured by Cleartron Radio, Ltd., and shown on the stand of Messrs. Priestly & Ford; the set has a very prepossessing appearance.

The second tendency revealed is the new and increasingly enterprising effort on the part of the manufacturers to meet the ever-growing needs of the amateur for components and accessories which are not only more fundamentally efficient, but also permit of much more critical control over tuning and the volume and pitch of reception than was possible twelve months ago. It was becoming a fashion in some quarters recently to decry the amateur constructor and prophesy his extinction with the arrival of the "complete set era." Nothing could have been farther from the truth, and, as this and other exhibitions have shown, the manufacturers are making a genuine attempt to keep abreast of progress in the design and construction of receivers generally, in which the amateur plays a large and important part. His contributions have helped considerably in the evolution of the single-control receiver, and will undoubtedly help a good deal more in the same direction, for nothing like finality has been reached yet. The supersonic heterodyne receiver still appeals essentially to the amateur constructor, and several interesting kits of parts were shown at Birmingham. Super-het kits are a conspicuous feature of the Igranic Electric Co.'s stand, whereon there are also shown a wide range of accessories and small parts which are intended primarily for the home constructor. The straight-line-frequency condenser, which is gradually replacing the square-law type and is likely to come still more into use when the new wave-length scheme is in general practice, is a prominent part of this firm's exhibits.

In the manufacture of small wireless parts Birmingham contributes very considerably to the wireless industry, and the prominence of micrometer tuning dials, short-wave coils, switches and plugs and sockets made by local firms is an impressive indication of the growing trade which is being done in them. The Radio Electric Stores, Birmingham, have on view a new set of short-wave coils, comprising four coils which, by plugging into a special stand, give a series of arrangements so that the entire short-wave range of from 15 to 200 metres can be covered with a 0.00025 tuning condenser in conjunction with the coils. Of the coils, one serves as an aperiodic aerial coil, and another is a tapped coil (part of which is tuned), the remainder being used for obtaining reaction on the well-known Reinartz principle. An interesting new product on the stand of Messrs. H. Boynton is the "Timeoscope," an adaption of the timing switch idea which gives automatic control of a receiver. By inserting it in the battery leads and adjusting a timing device, it can be used to switch off a set for any required length of time and to switch it on again automatically.

An exhibit on the stand of Messrs. E. A. Wood, which attracts a good deal of interest, is a set designed by a young Birmingham engineer, Mr. Derek S. B. Shannon, utilising two valves and dispensing entirely with aerial and earth connections. It is claimed that this set will give results equal to those obtainable with an eight-valve super-het, only one tuning control being used. Such a claim appears somewhat surprising. The set is an improved adaption of the duplex wireless telephony apparatus used by Mr. Shannon a few months ago in tests between a Great Western Railway Co.'s ship at sea and a shore station, in which two-way communication was established without the use of either aerial or earth. This is the first time the apparatus has been shown in public.

A feature of the Exhibition is the erection of a temporary studio from which a section of the staff of the B.B. Co.'s Birmingham broadcasting station transmit programmes at frequent intervals.

The Exhibition was organised by the *Birmingham Weekly Post*, in conjunction with Provincial Exhibitions, Ltd., and was formally opened on October 5th by Sir Charles Hyde. It will remain open to the public until to-morrow, the 16th inst.

A Diesel-Electric Dredger.—One of the most interesting dredgers is the *Sandmaster*, originally a freight steamer which was purchased from the United States Shipping Board by the Construction Materials Co. and converted. Unlike the majority of oil-engined dredgers built in the United States, she is a self-propelling seagoing vessel and her system of Diesel-electric propulsion is believed to make her first of her type. Her length is 263 ft. overall, beam 43 ft. 6 in., and the gross tonnage 2,018. She was built by the American Shipbuilding Co. in 1918, and contains two generating units, each of 400 kW, supplying power to two 500-b.h.p. electric motors. For discharging sand two pumps are installed, each coupled to a 400-h.p. electric motor, whilst two centrifugal pumps driven by 125-h.p. motors are employed for pumping water to make the sand sufficiently fluid for satisfactory pumping. The engines driving the main generators are 600-b.h.p. Worthington four-cycle single-acting units of the airless-injection design, the speed being 200 r.p.m. The propelling motors run at 130 r.p.m., the voltage being 240. Ward-Leonard control is employed, the main principle being the variation of the excitation current supplied to the fields of the main generators. Two waste-heat boilers generate steam for heating and general service, and a 60-h.p. Diesel engine drives a generator when the vessel is in port and the main dynamos are not running. According to the estimates, says the *Motor Ship*, there will be a saving of between £100 and £200 per month in fuel, reckoning Diesel oil at 2½d. per gallon and coal at 20s. per ton, the current prices in the area in which the vessel will operate; the crew is reduced by eight men, effecting a further saving of over £200 monthly. In addition, there will be substantial economy owing to the absence of stand-by losses and the infrequent bunkering required with a motor vessel.

Electrical Features of Manchester Civic Week.

During Manchester Civic week, which extended from October 2nd to the 9th, the inhabitants of Lancashire were given a unique opportunity of gaining knowledge of the history and present activities of the community of which they form part. One of the most popular resorts was the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. The management had decided to allow as many visitors as could be conveniently accommodated to tour the works, and these were shown round by specially appointed guides. Entering the main electrical aisle they were shown some of the

Fig. 1.—A Display of "Cosmos" Products.

largest motors at present in course of manufacture; among these may be mentioned the 2,500-h.p., d.c. winder motor for the Carlton Main Colliery, weighing 68 tons, and a huge d.c. motor with double field and armature giving a maximum of 8,000 h.p. for the Modderfontein Mines in South Africa. On a small stand next to this monster, a fractional horse power motor "no bigger than a man's hand," was on view, demonstrating the range of the company's products. On the test bed a 35,000-kW turbo-alternator was undergoing preliminary tests. Considerable interest was displayed in a turbo-generator

Fig 2.—A Decorated Metro-Vick Lorry.

rated at 43,750 kVA, 1,500 r.p.m., and another rated at 15,675 kVA, running at 3,600 r.p.m., which at present establishes a world record for output at this speed. Here also an illuminated M.V. monogram provided a lighter touch and illustrated the rotation of the phases by means of coloured lights.

Passing next to the mechanical aisle they moved among steam turbines and condensers of various sizes. One of these on the test plate gives an output of 40,000 kW; others in course of erection closely approximated to this power. Air coolers for the closed ventilation system and air ejectors with intercoolers were also on view. Condensers with 43,000 square feet of cooling surface and 8,750 tubes were in process of construction.

The visitors were then conducted to the stamping department and next passed to the works sub-station.

In the transformer department many large transformers were being built, and a special demonstration had been arranged of a 300,000-volt arc. This was flashed across a black background from different electrodes and made a very pleasing and artistic interlude in the proceedings.

After passing through the foundry, where pouring was in process, the visitors returned to the main building and mounted to the gallery. The first exhibit here consisted of electric railway control and signalling apparatus which was shown in operation. They then came to a specially-erected and tastefully-decorated stand (fig. 1) devoted to "Cosmos" products, including electric light fittings, fires, fans, domestic appliances, and wireless sets. Passing along the gallery devoted to coil forming and insulation, a staged exhibit of all types of windings, insulating materials, condenser terminals, &c., attracted much attention, and further on they paused at the exhibit of the S.P. wireless valve in all stages of manufacture. The visit closed with a tour of the departments devoted to motor control apparatus and switchgear.

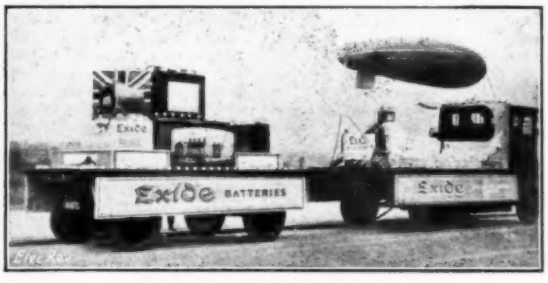


Fig. 3.—A "Chloride" Tableau.

The company sent a decorated lorry (fig. 2) to join the processions, organised by the F.B.I., which took place on the Wednesday and Saturday. This was symbolical in form, and represented the controlled electric forces driving the world. The well-known water tower of the company, a conspicuous feature for miles around, was introduced into the scheme, with a huge rotating globe. Brilliantly flood lighted, this lorry gained rounds of applause during its progress along the selected route.

Another company which took part in the carnival was the Chloride Electrical Storage Co., Ltd., whose tableau is illustrated in fig. 3. The display represented Amundsen's flight to the North Pole, and "featured" penguins and a wireless operator sending messages. The model airship was 14½ ft. long. The trailer was built up with illuminated pictorial panels depicting "Chloride" batteries for power stations and

Fig. 4.—A Transformer Parade at Manchester.

house lighting, the whole being surmounted by a large model motor-starting battery illuminated from inside. For night illumination 300 electric lamps, supplied with energy by "Exide" car-starting batteries, were used. The illuminated colour scheme was red, white and blue. The vehicle was a General Vehicles "electric" propelled by an "Exide-Ironclad" traction battery.

The British Thomson-Houston Co., Ltd., entered a brightly-illuminated car, and the Edison Swan Electric Co., Ltd., had a tableau presenting its "Fullolite" lamps. A motor-driven

pump was displayed by Messrs. Mather & Platt, Ltd., and Messrs. Matthews & Yates, Ltd., exhibited fans of various patterns, including two recently made for the War Office. The Corporation Electricity Department also participated in the processions with a car demonstrating the value of its public work.

The electrical part of the pageant was most effective at night, and formed a most important part of the pageant of all Manchester's industries.

MESSRS. FERRANTI, LTD., made the shipping of part of a large transformer order serve as an occasion to draw attention to an important branch of the British electrical industry. As the posters seen in our illustration (fig. 4) indicate, the transformers, which were paraded through the streets of Manchester on their way to the docks, are part of a large order for India, the Bhira power station of the Tata Power Co., Ltd.

Fig. 5.—The Town Hall Tower.

Fig. 6.—The Art Gallery.

The order calls for 12 transformers with a total capacity of 186,000 kVA and a primary pressure of 120,000 V.

As we reported last week, the Post Office staged a notable exhibit of cable and radio work, telegraph and telephone apparatus, and underground cable work.

Special illuminations were arranged during the week by the Corporation and some of the principal public buildings were flood-lighted with good effect. Our illustrations show the tower of the Town Hall (fig. 5) and the Art Gallery (fig. 6). In both cases the architectural details were admirably brought out. Another spectacle provided by the Corporation was a prettily-decorated and illuminated tramcar.

Manchester Lighting Service Bureau.

On October 5th there was opened at Fountain Street, Manchester, a new Lighting Service Bureau for the North-Western area. The operation of the bureau will be on very much the same lines as that of the Bureau in London, but the organisation in this case has been undertaken by a committee representative of each of the four sections of the electrical industry in the area which it will serve, *viz.*, supply authorities, manufacturers, wholesalers and contractors. There has been a good response to the appeal for financial assistance and the committee confidently anticipates that further support will be forthcoming.

At the opening ceremony, which was performed by the Lord Mayor of Manchester (Councillor Miles Mitchell), the chairman of the committee, Mr. P. P. Wheelwright, M.I.E.E., of Blackburn, presided over a large gathering of the electrical trade leaders in the North-Western area. The proceedings commenced in a typically badly-lighted room, and after Mr. Wheelwright had made an introductory speech, the Lord Mayor switched on and the room was immediately lighted on the latest approved principles. A vote of thanks to the Lord Mayor was proposed by Mr. J. H. Farthing, A.M.I.E.E. (General Electric Co., Ltd.), and seconded by the borough electrical engineer of Liverpool, Mr. H. Dickinson, M.I.E.E. The thanks of the meeting were given to the chairman and committee on the proposition of Alderman Walker, and Mr. H. C. Lamb briefly responded.

After the ceremony a demonstration was given to those assembled by Mr. W. E. Bush, of E.L.M.A. The premises consist of office, waiting room and store leading to the main demonstration room, which is divided on one side into private rooms, where the latest developments in household lighting may be demonstrated. A large shop window has been erected for the display of the latest features in this class of lighting and large posters have been put up with suitable lighting effects to show their possibilities when properly utilised.

The staff will be able to give demonstration lectures in the districts of subscribers, and for this purpose a portable demonstration equipment packed in suit-cases is kept. Printed lectures, together with demonstration showcases and lantern slides, are available, and cards of invitation will be supplied. Subscribers' clients will be welcomed at the Bureau, or, alternatively, invitations will be issued by the Bureau at a subscriber's request.

The hon. secretary of the committee is Mr. H. A. Pryor, 196, Deansgate, Manchester, and the organisation and supervision of the Bureau is in the hands of Mr. Hawkins, of E.L.M.A.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Motor Switch.

The accompanying illustration, fig. 1, shows a new motor switch for star-delta, series-parallel and direct starting, which has recently been marketed by MESSRS. HIGGS MOTORS, Witton, Birmingham. By using pressed parts the price of the apparatus has been reduced to a more reasonable figure than is usually the case with this type of equipment. The starter is intended for industrial use, but it is not suitable for duty

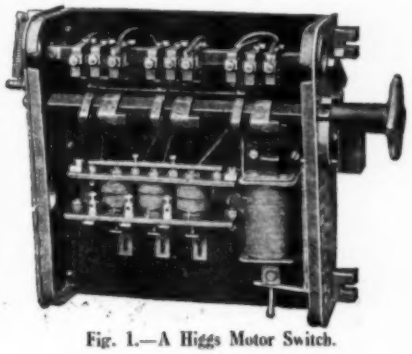


Fig. 1.—A Higgs Motor Switch.

where it would be exposed to the weather or gas-laden atmospheres. It is claimed to be impossible to move the handle direct into the "run" position. The contacts are interchangeable and the case is arranged for conduit wiring. When stopping it is impossible to pass through the "start" position. The illustration shows the starter fitted with a no-volt and three overload releases. A double break per phase is provided and all the coils are enclosed. Bakelite insulation is used and ample cable space is provided. In the "off" position the motor is completely disconnected from the line. Under test the device was subjected to 2,000 starts per day.

A Siluminite Bird Guard.

Referring to the article commenced in our last issue by Mr. W. E. Poole, on "Structural Design of Overhead Lines," the SILUMINITE INSULATOR CO., LTD., of The Green, Southall, Middlesex, sends us particulars of a new design of bird guard which it is placing on the market, and which is believed to have many advantages over the existing types.

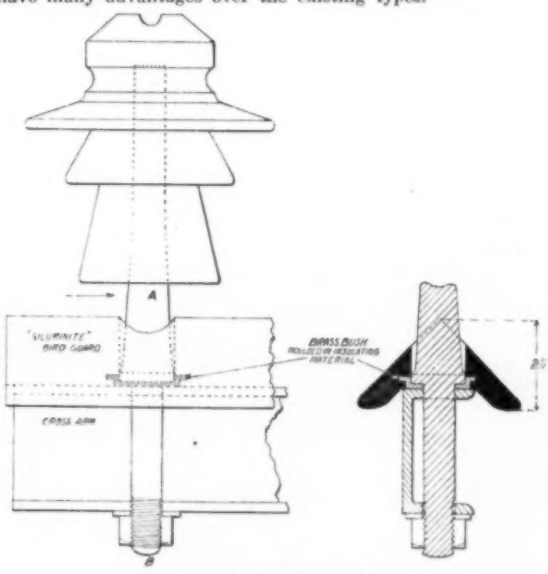


Fig. 2.—A Siluminite Bird Guard.

This bird guard (fig. 2) is made in Grade 2 Siluminite, which is exceedingly hard; hence, the bird cannot possibly get its claws into the material. A section of the material is very much like figure 13 on page 571 of our issue of October 8th, except that its two protruding lips which come down below the channel iron form a petticoat over the iron which prevents creepage due to moisture should the bird come in contact with the live wire on a wet day.

We have received also a copy of a report from Faraday

House on this material, which shows that it is of good dielectric strength, wet or dry. Another point in its favour is that it is capable of withstanding an arcing test without carbonisation. This, it is hoped, will get over the difficulty of coal dust or other dirt accumulating on the surface.

The method of fixing is exceedingly simple, as there is a brass bush moulded in the hole, on which the pin rests, clamping the bird guard securely on to the cross arm, and no further drilling of the arm is necessary; at the same time the thickness of the bush is such that extra long pins do not have to be employed.

The Faraday House report states that the specific insulation resistance of a sample of grade 2 siluminite was found to be 4.3 million megohms per cm³., dry, and 1.9 millions after 24 hours' immersion in water. Its breakdown pressure (1.48 cm. thick) was then 26,700 volts. An arcing test had no apparent effect on the material.

A Novel Lamp-marking Outfit.

What is described as the "Glamat" lamp protector is an electric lamp-marking outfit which has been designed to stop the theft of lamps and is being sold by Mr. I. Brook, D.Sc., 27, Fairfax Road, Chiswick, London, W.4. The object of the device is to stamp the lamps at the bottom where the marking can be easily seen, thus reducing the saleable value of the lamp. The outfit comprises the stamp and the necessary "ink," pad and brush, and a suitable container. The stamp consists of a bell-shaped holder, across the mouth of which

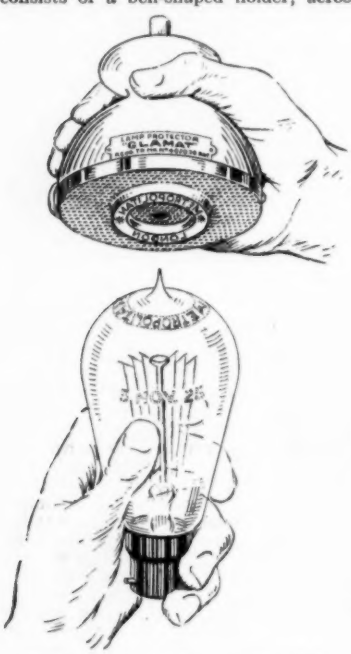


Fig. 3.—"Glamat" Lamp-marking Pad.

is stretched a flexible diaphragm to which is centrally attached the circular marking element. Fig. 3 shows clearly the application of the stamp to the bottom of the lamp. An internal plunger is provided for pressing the stamp to the inking pad.

An Improved Water Level Indicator.

A simple but ingenious device, fig. 4, has been introduced by Messrs. Pape & Bennison, 23, Stanley Road, Barrow-in-Furness, for showing clearly the water level in the boiler water-gauge glass. The essential feature is a strip made up of steel rods and aluminium balls A, arranged alternately, which is placed at the back of the gauge glass. The rods are painted with heat-resisting paint, green up to the maximum permissible water level and red above it. The effect is to show clearly an intermittently coloured strip B (according to the height of the water) as wide as the glass representing the water. It is claimed that the water level can be seen in the faintest light from any part of the boiler house from which the glass is visible. An advantage is that the device is immune from damage by the glass bursting. The chain C carries a spare clip for attachment to any suitable part.

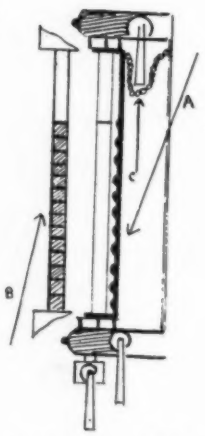


Fig. 4.—Improved Boiler Water-Gauge Glass.

A Miniature Cut-out.

An interesting development by Messrs. J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham, is a small fuse unit designed for use on small-current circuits. The design fully complies, it is claimed, with the Home Office requirements. The fuse handle is non-reversible, the planes of the top and bottom contacts being at right angles, and a spring grip enables the position of the handle to be maintained in excessive vibration. A projection on the porcelain handle which slides into a suitable recess in the base renders the contacts self-aligning. The contact clips are of phosphor-bronze. The fuse wire passes through an asbestos tube, which is permanently attached to the handle by means of small metal clips held by the contact pieces. Loose leading-in bushes have been avoided by incorporating them in the porcelain base. The device is ironclad, the hinged door, covering the bulk of the interior, being silicate lined. The device is rated for a load of 15 A at 250 V, or 10 A at 500 V. On test at the National Physical Laboratory a sample of the cut-out dealt successfully with a short-circuit current of 2,000 A at 240 V, d.c. The overall dimensions of the device are 3¼ in. long, 3¼ in. wide, and 2½ in.

Figs. 5 and 6.—A Miniature Cut-out.

deep. Figs. 5 and 6 show the fuse open with the fuse handle in and out of position respectively; the projecting guide on the handle is not shown.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Lightning Rod Act in Ontario, Canada.

In reply to the letter in the Electrical Review of October 1st, to have given details of the regulations would have taken considerable space; with regard to the suggestion that "an erroneous concept had been quoted as to the earth terminals," no particulars were mentioned in the report sent to me. Mr. Isherwood's contribution as to the influence the depth of ground connections may have on the discharge from an electrified cloud, is very interesting. I should like to refer him to Sir Oliver Lodge's article on the characteristics of a lightning flash, published in the 1905 report of the Lightning Research Committee; also to the suggestions as to earths, which I understand have given good practical results.

The report of the L.R.C. is published by Messrs. Crosby, Lockwood, London, in a book containing illustrations of some of the buildings damaged, although provided with lightning conductors.

Killingworth Hedges.

St. Stephens Club, Westminster, *October 8th.*

It is stated by Mr. Gilbert that a deep earth appears to be necessary for the protection of a building from lightning, if that building is situated upon non-conducting strata and the thunderstorm bursts out after a long spell of dry weather.

The reasons for this assumption are that the occurrence of a flash to earth necessitates its neutralisation by an equal charge of opposite potential on the earth, and that this charge obtains only at the surface of the lower conducting strata, and not on the non-conducting surface of the earth. More particularly would this appear to hold good in the case of "B" flashes.

If this were so, then flashes which pass to an arid desert would produce fulgurites consisting of vertical tubes reaching to the lower conducting strata; there would not be any breaks in their walls except at the conducting base, where they would branch out laterally, and where the fused siliceous mass would be found. I have not seen a single example of this type recorded.

Prior to the actual passage of the flash in a case such as the above, the field of the charged cloud has extended through and ionised a considerable depth of dry air, which cannot be regarded as a conductor any more than can the sandy covering of the earth.

It seems illogical to assume that in these cases the charge is not on the surface of the ground owing to its non-conducting nature, for if that were so, then dry stone buildings such as church spires would be immune from danger, provided that they had no lightning conductors or other metal about them.

Lightning rods are necessary evils, but evils all the time, for whilst their functions are primarily to neutralise an oppos-

ing potential and thus prevent a flash from passing, and secondarily to provide a safe and ample path for the passage of the momentary current in the case of a flash, still, as they are purposely fitted at a greater altitude than the points which they protect, they lessen the distance to the charged cloud and increase the "probability of being struck" (p.b.s.), and consequently increase the lesser danger from branching or side-flashing through the walls of the protected building to metal-work inside it.

For this reason they should not reach to a great distance above the most salient points of the building, and in like manner their earth terminals should not reach to an extreme depth in the earth or distance from the building, for such connections tap other charges and simply increase the p.b.s.

In the case of the lightning conductor which is stated to be 3½ miles long, reaching from the Zugspitze meteorological station down the hill to "an adequate earth" in a lake, obviously the presence of a thundercloud over the lake may result in the passage of a flash from another cloud over the meteorological station to the skyward finial of the conductor, which flash might never have passed if the conductor had not exceeded a reasonable length.

Radio aerials, unlike lightning conductors, usually have a considerable horizontal portion at a goodly altitude above the building, and increase enormously the p.b.s. Attic aerials and even ground-floor indoor aerials, too, have a tendency to increase the p.b.s. I have on different occasions drawn sparks from my own radio aerial when isolated, but have never been able to obtain a spark from other isolated metal-work about the house.

Radio aerial lead-in wires are very rarely of a cross section such as may be considered above suspicion for dissipating lightning flashes without injury. More often than not they have sundry right-angle bends, and lead to earth only by a tortuous path which is most likely to induce side-flashing. The danger to which I referred in my previous note is that of increasing the p.b.s. by means of unsuitable material unsuitably fitted, which will probably result in side-flashing in the event of the aerial being struck.

E. Isherwood.

Saltcoats, *October 9th*, 1926.

Relief Bolts and Flameproof Enclosures.

My article on "Vents Applied to Flame-proof Motors" (which Mr. R. Amberton criticises in your issue of the 1st inst.), was written in view of that increasing interest in the subject which I have observed in mining electrical engineering circles, and to contribute something towards filling an apparent gap in the common knowledge of the orders of magnitude of the relevant factors. Accordingly, I wished to present almost the whole of my article as a treatise on the fundamental considerations governing the application of *any* type of vent, including relief bolts; and I submit that Mr. Amberton's first criticism that "Mr. Huggins extols the use of certain forms of protection to the extent of nearly three pages," is an astonishing misrepresentation of the facts.

Replying to Mr. Amberton's second point, I consider that it has been amply demonstrated by tests made during the past twenty years that relief bolts do not provide the maximum pressure release for the ultimate A/V ratio. For more recent recitals on this point those made during the proceedings of the Association of Mining Electrical Engineers are of interest—see the remarks of Messrs. F. W. Close and F. G. Ketellby, reported on page 223 of the *Mining Electrical Engineer* for December, 1925.

Finally, Mr. Amberton suggests that it might be as well for me to set out a few of my "unspecified" reasons for preferring constant-aperture devices to relief bolts, but I rather thought the undermentioned further reasons were also deducible from my article:—

(1) Motors required for extremely wet mining sites are usually fitted with watertight jointing. Relief bolts on such machines would not (*a*) hold the jointing securely against explosive pressures, (*b*) prevent a partial vacuum being formed inside the motor immediately following an explosion, or (*c*) cater for the normal breathing action of the motor.

(2) Relief bolts could not replace constant-aperture vents on those motors where vents have been introduced with one or both of the following objects: (*a*) the best preservation of the windings, (*b*) to act as inlets and outlets for air circulated to cool the motor.

I know mining electrical engineers who consider that properly conducted aerification conduces to the fitness of motor windings; and from my study of the problem, particularly of the properties and actions on electrical windings of humid atmospheres, I think they have made an accurate and useful observation.

Percy Huggins.

Wakefield, *October 7th*, 1926.

The Remuneration of Electrical Engineers.

Referring to the letter headed "Remuneration of Electrical Engineers" over the initials "G.T.C., H.V.M., and L.H.," in the issue of your journal dated July 30th last, which has just been brought to my notice, I am wondering if it has occurred to the writers of the letter to ask themselves how it is that the "three daughters of the local grocer" have failed apparently to realise what they are missing. These ladies might be better able than many of us to give the reason why the three gentlemen in question have failed in their search for more remunerative employment.

My experience has satisfied me that it is an extremely difficult matter to find a suitable man to satisfactorily fill a position worth, say, £300-£400, in the electrical supply industry, and judging by numerous applications for such posts which I have received during the past fifteen or twenty years, there are seldom three applicants out of every hundred who appear from their applications to be suitable for such posts.

I would strongly advise the three gentlemen referred to to apply to the "three daughters of the local grocer" for the real reason of their present predicament.

I enclose my card, and for the sake of peace sign this letter

Chief Engineer.

September 29th, 1926.

In a recent issue (July 30th) three engineers, G.T.C., H.V.M., and L.H., state that after five years' experience they meet with an average remuneration of £200 a year. The enclosed cutting from the *Newark Herald* (September 25th, 1926) needs no comment.

Economy?

[The cutting relates to the engagement of "an assistant to the electrical engineer" at a wage of 25s. per week. He was described as an apprentice, with five years' experience.—Eds. Elec. Rev.]

Electrical Refrigeration Classes.

In recent issues of your journal, you have directed and advised electrical contractors to give their consideration to the question of refrigerating plant, both of the domestic and the small commercial types.

In view of the forthcoming restrictions by law of the use of preservatives in food, it is thought that there will be considerable developments in the use of such plant, and that it is, in consequence, very desirable that electrical contractors and their employés should at least have a working knowledge of the principles involved.

May I therefore draw your attention to the fact that the London County Council has made arrangements for classes in refrigeration at the Smithfield Institute, E.C., on Tuesday and Thursday evenings for a comparatively small fee?

Any interested persons should communicate with the undersigned, when full particulars will be forwarded.

Walter H. Nevell,
Head of the Institute.

The Smithfield Institute, Saffron Hill, E.C.1.
October 7th, 1926.

The London Electricity Supply Companies.

The bonus distribution of the Kensington and Knightsbridge Company has brought matters to a point that no longer admits of delay. As one understands, the reserves of the London companies are to be distributed among their shareholders, but it seems to me that difficulties may arise as to the right of participation of different classes of shares. For instance, the Articles of the County of London Company make the preference shares not preferential but to share equally in any distribution of capital, although they are cumulative preference shares for dividend. The question at once arises: What is "Capital"? Then, again, in the case of the London company which belongs to the other or West End group, the preference shares are not cumulative preference for dividends. As they have not always had a dividend, and, in any event, have to stand the racket like preferred ordinary shares, it would seem that they are entitled to some consideration with the rest of the shares. Other difficulties arise with other companies, but my purpose is not to attempt to enumerate them, but merely to call attention to a matter which those who are concerned had better discuss, and if possible settle in advance instead of waiting until proposals are thrown at them at a general meeting which are certain to seem to one party or another inequitable. In the case of the Kensington Company all the bonus goes to the ordinary shares. It must be remembered that the conversion into paper of reserves that may now be represented by material assets does not really improve the position of the preference shareholder, and he in most cases has a vote at the general meeting. Then when it is all over there comes the still more difficult question of the splitting of the shareholder's interests in his purely selling London company and in the out of London properties which it is understood will have to be undertaken by two newly-formed companies, whether the present companies associate themselves into two groups for their distributing work or not.

William Guy.

London, *October 9th*, 1926.

[This matter is briefly referred to in our "Stocks and Shares" column this week.—Eds. Elec. Rev.]

Application Binding Fees.

Is it customary when remitting a binding fee to firms, for them to retain that fee after your application has failed? I wrote for a position as junior engineer on the Shannon power plant, I.F.S., advertised in the Electrical Review, April, 1926. I have since received an answer to say that my application has failed, but I have not received my 7s. 6d. binding money.

With seven positions advertised for, it looks as if it has turned out a good thing for the Irish Free State, considering the number of applications for the posts.

C. A. Holland.

Walsall, *October 7th*, 1926.

The Tungstone Accumulator.

The advertisement of the Tungstone Accumulator Co. in this week's issue of your paper, seems to me liable to give the impression that the efficiency test certificate given it by the National Physical Laboratory proves its claim that the Tungstone accumulator is the most reliable and durable and has the longest life of any accumulator on the market. No doubt it was far from the intention of the Tungstone Accumulator Co. to convey this impression, but I think it should be pointed out that the certificate did not go beyond giving the efficiency calculated in the manner shown thereon.

Moreover, as you pointed out when you received the figures from the Tungstone Accumulator Co., the efficiency does not appear to be exceptional considering the way in which it was arrived at—a method which does not conform with working conditions.

J. S.

October 5th, 1926.

A National Wireless Week.

Arising out of a suggestion made by the writer, the period dated November 7th to 12th is to be set apart as a "National Wireless Week." A very excellent programme has been arranged by the British Broadcasting Company, and the idea is that every owner of a wireless set should, during that week, invite his friends to come and listen. In other words, every wireless-set owner is asked, like the Boy Scout, to do a daily good deed in this manner. A large number of people do not realise that a wireless set has long ceased to be merely an expensive toy, but is rather a means of receiving song, sound, and speech for the purpose of instruction and entertainment. So, during this week, they are to be given an opportunity to hear what modern reception is really like.

It is hoped that every reader who has a wireless set will put it into first-class order and then make a special point of inviting his friends to come in and listen during this National Wireless Week. Incidentally, this is also the birthday week of the B.B.C. Again, during the same period, Armistice Day occurs; a wonderfully inspiring memorial programme has been arranged for that occasion, which should not be missed by anyone, particularly those who do not possess a good wireless set. So in the words of the slogan adopted for National Wireless Week, November 7th-13th, "Let Your Friend Listen."

R. Borlase Matthews.

East Grinstead, *October 11th*, 1926.

Legal.

Alleged Excessive Lighting.

At the York Police Court, on October 8th, the managers of the shops of the Saxone Shoe Co., Ltd., and Mason's, York, and Alec House, electrician, York, were summoned for infringement of the lighting restrictions under the Coal Emergency Regulations, by the use of display and advertisement lighting. The Chief Constable said that the standard he had laid down was one light per shop window, which he considered was adequate for protection of the premises, seeing that there was no general restriction on inside lights. Mr. House, an electrical contractor, was burning lights to illuminate lamp shades, and also an electric fire. When spoken to, he turned off the lamps but declined to switch off the fire. He regarded the fire not merely as an advertisement, but as an indication to people needing urgent repairs that he was on the premises. In the first two cases, the defendants were bound over as they were the first cases under the Regulations. The case of Mr. House was adjourned for him to provide an alternative indication of his presence to people wanting repairs.

Offences Under the Bankruptcy Act.

The *Birmingham Post* reports that on October 6th, at the Birmingham Quarter Sessions, Albert O'Hara Bradshaw, general merchant, was charged with offences under the Bankruptcy Act. Mr. C. Coley, for the prosecution, said that the defendant commenced business as a wireless dealer in 1922, with a capital of £50 and a guarantee of £250 from a relative. He purchased a large amount of goods from London, sometimes on credit, and sometimes he paid for them. In many cases the goods obtained were sold immediately after delivery at, the prosecution alleged, prices lower than their cost. He filed his own bankruptcy petition in 1923, when his unsecured creditors amounted to over £11,700, and his deficiency was £1,200. In addition judgment for £8,800 had been obtained against him and the total of his unsecured creditors would probably be over £13,500. His total purchases had amounted to £27,000, while his sales had brought in £18,000. In many cases defendant's cheques had been dishonoured, although it should be stated that a large part of the goods thus obtained were returned.

A witness said that defendant's drawings had not been unreasonable.

Police evidence showed that the defendant had received sentences in Canada and had been deported.

Mr. Williams, for the defence, said that his client had entered the radio accessory business without previous experience and had lost money on two large contracts with leading electrical firms. He had come into contact with men who were sharper in business than he was.

Bradshaw was sentenced to nine months' imprisonment in the second division.

Compensation Claim Fails.

Frederick Prentice, of Sowerby, Thirsk, recently brought an action at Thirsk County Court against the Northern Counties Electricity Supply Co., Newcastle, for the loss of earning capacity in consequence of injury received while in the company's employment. Mr. M. Lester, for the claimant, said he was employed at the Thirsk generating station of the company as a labourer. On December 8th, 1925, he met with a serious accident, and was totally incapacitated until January 11th, 1926. He was lifting a manhole door into position on a boiler when he strained himself in the groin. He reported the matter at the time. He could not work now as a labourer. On January 11th he returned to work and did light jobs, but was afterwards dismissed without explanation. His Honour Judge M'Carthy said that it was purely a question of incapacity. If he were incapacitated the company was liable. Mr. C. Fenwick, for the company, said the claimant was on the temporary staff, and when the work was finished he was paid off with other men. He immediately obtained other work, which he followed until incapacitated by a bicycle accident. After hearing medical evidence, his Honour gave an award for the respondents, with costs.

Reviews.

Superpower. By William Spencer Murray. Pp. ix+237; figs. 25. London: McGraw Hill Publishing Co., Ltd. Price 15s. net.

One would imagine that a book possessing such a title as "Superpower" would have as its author a super-remarkable man and, at a guess, an American. And so it appears, for Mr. William Spencer Murray is a Doctor of Engineering, Lehigh University, was Engineering Chairman of the U.S. Government Superpower Survey, 1920-21, and is now a partner in the firm of Messrs. Murray & Flood, engineers. In the Foreword we are taken into some confidence and allowed to picture such a personality resting, after toil, in the Rockies of Colorado in the year 1919. Here in the quiet solitudes the happy and appropriate thought flashes into consciousness "that we needed greater confidence in each other, more unity of effort and broader co-ordination in power production and utilisation; to express this the composite word 'Superpower' suggested itself." It probably would, but we agree with the author that a more suitable title, though not quite so striking, would have been "Interconnection," and we would have added "Its Importance and Advantages."

The great benefit of "Superpower," according to the author, "lies in its utilisation of the law of *diversity economy*," which, we presume, as we know of no such law over here, is the American way of saying that interconnection improves the station load factor because of a greater diversity of demand. The author, of course, realises this and considers it more fully later on, and quite properly draws attention to the gain to be found by setting free for useful service a considerable proportion of normally idle and unproductive generating plant, and claims that costly interruptions from breakdowns are eliminated. A summary of the advantages to be derived from coupling on a large scale is given at the end of the first chapter and divided into seven headings, as follows:—

1. Reliability of service.
2. Diversity economy.
3. Improved load factor. (In America, apparently, the "Peak" for the purpose of determining the load factor of a station is taken over 60 minutes!)
4. Reserve plant. (Reduction of 50 per cent.)
5. Overall plant economy.
6. Real estate. (Lower capital cost per kW installed.)
7. Lower costs. (Lower fixed and running charges.)

His conclusions are based upon the experience gained in the States first as chairman of the Superpower Survey, 1920-21, when he was in close collaboration with the best and most distinguished American engineers—and there are many—and in some of the subsequent developments, mergers, and interconnecting schemes now operating at pressures of 100,000 volts or more.

Divested of its garb of semi-advertisement as disclosed in its pages, especially in the chapters devoted to "The Superpower Survey," and of a certain verbosity and looseness of expression, the book has merit and should be read, if only to appreciate the chapters on "The birth of Public Utilities" and "The Ownership of Utilities"; and one or two little bits of potted wisdom or nutshell knowledge such as "Service is the rent we pay for the space we occupy," and "We should willingly destroy the tools of the past if out of their ashes there can arise the creation of others economically justified."

The chapters on the choice of the most suitable way of developing and conducting a public service are of interest at a moment when our own Electricity Bill is about to come before

the House of Commons for a third reading. The author's opinion is "that government functions should be confined to insuring to the people life, liberty, and the pursuit of happiness, and that private initiative and enterprise should develop and manage under suitable public regulation the great natural resources of this country." In the United States, it seems, only 5 per cent. of the kW in public electricity supply is municipally owned, as against 65 per cent. in Great Britain—"in consequence of which the British worker has about one-third the mechanical power back of his labour that is enjoyed by the American operative. His wages are correspondingly low" This is a *non-sequitur* statement, but contains a certain amount of truth. Private enterprise with customer ownership and the State at the helm to steady the craft seems to epitomise Mr. Murray's tendencies. Reference is made to the *so-called Lloyd George Coal and Power Report*, and its findings are referred to, such as: "Our present proposals place the whole executive management in the hands of private enterprise." If it is found that vested interests, that is, municipal powers, are prepared to block the way, the line must be cleared and the Electricity Commissioners must have the power to effect the clearance."

A Mr. Theodore Dwight is also quoted as having recorded that in the United States "Good service from privately-owned public utilities is assured through regulations enforced by Public Service Commissions whose duty it is to see that both the public and the corporations receive just treatment."

An interesting chapter on "Railroad Electrification" is included. It shows how far the creation of cheap and abundant supplies of electrical power is dependent upon the development of railway electrification, and to what a great extent the electrification of railways is dependent upon a cheap and available-at-all-points supply of electricity. It reviews the whole American railway electrification position—more unsatisfactory it seems than our own—and supports finally, as a possible solution of the problem, developments on a three-phase to high-voltage d.c. (3,000-V) rectifier system.

Under the heading of "The Field of Superpower and Economic Studies," many interesting diagrams, including those of growth of output, and many useful data are given. They will no doubt be as useful to our engineer cousins in the States, as indicative to us of possibilities in our country.

If one realises sufficiently, and makes allowance for, the different conditions governing electricity supply in the States, as compared with those in Great Britain, such as the political instincts of the people and their general attitude towards production, much benefit may be derived from the perusal of this book, which exhibits an earnestness and pushfulness which are refreshing.

Elements of Alternating Currents and Alternating-Current Apparatus. By J. L. Peaver, M.S. Pp. viii+370; figs. 304. London: Longmans, Green & Co. Price 18s. net.

According to the preface this book has been written for beginners in the study of alternating currents, and it is compiled in a manner suited to either electrical or non-electrical students. It is divided into two parts, the first embracing eight chapters which deal with the elementary principles of alternating currents, while the second is covered by the remaining five chapters, which are devoted to studies of the commonest types of a.c. apparatus.

Chapter I deals in a very simple and easily understood manner with the all-important foundation subject of vectors, giving vector definitions and showing the principles of vector addition and subtraction. In both cases two and more than two vectors are considered having different magnitudes and phase angles. A small point that we think the author might advantageously include in a future edition is an indication that reversal of a vector can as truly be represented simply by reversing the order of the vector symbols as by placing a minus sign before the original order of symbols

Chapter II outlines basic alternating-current conceptions.

In Chapter III average and effective values of a.c. voltage and current waves are discussed, and the relationship is clearly shown between average, effective and peak values of sine waves. An interesting treatment of the conception and calculation of a.c. power is given, together with a useful summary of the meanings of different a.c. expressions.

In Chapter IV the principles of rate of change are discussed and illustrated by vector and sine-wave diagrams. The author gives a brief study of the electromagnetic and electrostatic fields, and we think a great deal more might advantageously have been said concerning these, even in an elementary work. We have found considerable confusion of thought to be present with many electrical students concerning the fields surrounding electromagnetic circuits, and a fuller treatment of these would, we are sure, well repay the author.

A.c. excited series circuits composed of different arrangements of resistance, inductance and capacitance, are investigated in Chapter V. In each of the cases taken the appropriate vector diagram of pressures and current is given, which materially assists the student to obtain a thoroughly sound grounding in the elements of a.c. series circuits.

Chapter VI deals with parallel circuits on lines similar to those laid down for the preceding chapter. Here, also, the appropriate vector diagrams are given.

Chapter VII commences what we may term the more serious study of alternating quantities, that is, the study by means of the complex quantity or symbolic notation. The author first shows the basis of the symbolic notation, pointing out that the method is only applicable to vectors of fixed lengths and relative positions, so that the system can only be applied correctly to sine-wave quantities of the same frequency; non-sinusoidal periodic quantities on the other hand must be treated as equivalent sine waves if the symbolic method is to be adopted. Examples illustrated by vector diagrams are given of the addition, subtraction, multiplication and division of two complex quantities, and these are set out in an exceedingly clear manner which will appeal to all students of this particular branch of alternating-current study. A thorough study of this chapter will well repay any student.

Chapter VIII deals with single-phase and polyphase relations, showing how single-phase, two-phase, and three-phase e.m.f.'s are generated and how voltages applied to external circuits from such generating systems and the currents flowing in them are represented by sine waves and rotating vectors. Proofs are given of the accuracy of the two-wattmeter method of measuring three-phase, three-wire power, and this is another section that we think the author would be well advised to elaborate in any reprint of the volume. The treatment might be extended to show how the power factor can be derived under balanced and unbalanced conditions from the wattmeter readings.

Chapter IX deals entirely with transformers, commencing with the theory of a perfect unloaded transformer, which is defined as one having no losses or magnetic leakage. The conditions that arise when such a transformer is loaded are next discussed, and vector diagrams are shown for loads at lagging and leading power factors. The effect of the pressure drops due to resistance in the primary and secondary windings is next indicated and illustrated by vector diagrams for loads at unity, lagging and leading power factors, while subsequently the effect of magnetic leakage on the terminal pressures is studied in the same way. We think it is a pity the author has not followed this otherwise excellent treatment to its logical conclusion by combining the diagrams showing the effect of resistance with those showing the effect of reactance, so obtaining the usual diagrams representing the actual practical conditions and embodying the total impedance. The author next proceeds to consider the effect of hysteresis in the iron core, and here, again, we wish a fuller treatment had been given. The case is only considered where the impressed e.m.f. and therefore the flux, is sinusoidal, giving a peaked wave of magnetising current; the treatment to be complete should have included the converse of this, namely, the case where the magnetising current is sinusoidal and the induced e.m.f's peaked. This would have enabled the author to give at least some idea of the harmonic phenomena thus introduced, and we know from experience that this would have been most helpful.

The theory and principles of synchronous generators and motors are given in Chapter X, and the polyphase induction motor is discussed in Chapter XI, which is concerned with the revolving field, continuous torque, the action of the motor under varying speeds, the effect of inserting a starting resistance in the rotor circuit, and slip.

Chapter XII discusses various forms of single-phase induction motors. Chapter XIII deals with methods of converting alternating into direct current. Only the synchronous converter is discussed with any pretence to completeness, and even this is capable of considerable amplification.

The volume is completed by two appendices, dealing with a.c. measuring instruments and with some problems on transmission lines.

Apart from the relatively minor strictures we have already passed, our criticism mainly concerns the illustrations. Half-tone illustrations are, we think, a great mistake unless printed on paper specially made for the purpose. The line drawings in all cases leave very much to be desired, and it is a pity that diagrams which are so well conceived should have been so badly executed. This is another matter we should like to see improved in a future edition of the book.

In spite of its deficiencies the volume is one that on the whole we feel we can cordially recommend to new students in the profession, or to those older members who are desirous of renewing their acquaintance with a.c. elements.

S. Austen Stigant.

Modern Picture Theatre Electrical Equipment and Projection. By R. V. Johnson. Pp. xii +170; figs. 79. London: Crosby Lockwood & Sons. Price 15s. net.

In presenting this summary of the uses of electrical energy, as applied in the modern picture theatre, Mr. Johnson has chiefly in view the needs of theatre managers and architects, to whom it is a great advantage to know something of electrical requirements. The treatment is therefore made as simple as possible, and the advice is, in the main, concise and practical. After a very brief discussion of voltages and conditions of supply, the wiring of the installation is described and the various appliances illustrated. The intake chamber, the generating room, the projection and rewinding rooms are in turn described, and there are sections dealing with the management of dynamos and motors and the motor generator. All these sections are necessarily brief. The actual projection equipment, including projectors of various types, lenses, screens, and films, receives about sixty pages, and thus occupies a great part of the book; details here are chiefly of interest to the operator, for whose guidance some practical hints are given. Attention is drawn to the introduction of projectors using mirrors in place of condensers, which have proved of great benefit to the small showman

There are short sections on lighting, heating, and ventilation. One is glad to see the importance of avoidance of glare emphasised. Reference is made to the increased part played by colour in modern schemes of auditorium lighting, and there are some notes on "effect lighting" and secondary or emergency lighting. At the end of the book there are a number of "bright ideas" and hints briefly presented, a series of "dont's" for operators, explanations of electrical terms commonly used, and extracts from the regulations; diagrams of a few typical switchboards are presented. The equipment and design of kinema theatres is nowadays a very big subject, and complete books might well be assigned to many of the problems here briefly dealt with. Mr. Johnson's general treatment should, however, prove helpful to many of those who wish to have some practical insight into these problems, and will serve as a useful introduction.

A First Course in Wireless. By Robert W. Hutchinson, M.Sc., A.M.I.E.E. Pp. x + 262; figs. 208. London: W. B. Clive, University Tutorial Press, Ltd. Price 3s. 6d. net.

This book is intended for all those who wish to obtain a knowledge of the fundamentals in the theory and practice of wireless telegraphy and telephony.

The first third of the book is devoted to an explanation of as much of the theory of electricity and magnetism as is required for a proper understanding of the remainder, which is devoted to wireless. Most of this latter portion is taken up with reception, but the main principles of transmission are also explained, and a student starting with no knowledge at all of electricity, and only a very elementary knowledge of mathematics, should at the close be in possession of a sound comprehension of the main principles and up-to-date practice of wireless communication.

Mr. Hutchinson has a flair for simple lucid explanation and leads on the student in easy stages from the hackneyed rubbing of amber on the first page to the latest visions of television on the last.

The production of the book is up to the high standard set by the University Tutorial Press, and the only typographical error we noticed is the printing of L_1 for L in fig. 196.

This is a book which we have no hesitation in recommending to all students as an excellent introduction to the subject, especially to that ever-increasing class which is mainly interested in the reception of wireless telephony.

Intermediate Text-book of Magnetism and Electricity. 2nd Edition. By Robert W. Hutchinson, M.Sc., A.M.I.E.E. Pp. 630; figs. 407. London: University Tutorial Press, Ltd. Price 9s. 6d. net.

This book contains a practical and theoretical course on magnetism and electricity up to the University Intermediate standard. The work is based on fundamental experiments, accurate scientific principles and definitions. The work is written in 23 chapters, the first nine of which are devoted to magnetism and electrostatics. The next few chapters, dealing with such subjects as batteries, units, effects of currents, electromagnetic induction, and alternating currents and transformers, might be described as the engineering section of the book; it is written in a practical manner and might suitably be incorporated in an elementary manual on electrical engineering. Radio is treated towards the end of the work and the concluding chapter deals with more advanced work on radio-activity and electron theory. Much of the work in these last chapters is new to this edition.

Trade-Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 6th:—

R & R (lettering and design). No. 469,200. Class 6. Electric brakes, &c.—Ransomes & Rapier, Ltd., Ipswich.

Rectalloy. No. 462,373. Class 8. Instruments and apparatus for use in radio-telephony and telegraphy.—J. H. T. Roberts, 39, Queen's Gate, Kensington, S.W.7.

Lodgen. No. 469,213. All goods in Class 8.—Sir Oliver Lodge, Normanton, Lake, Salisbury.

Edison Bell. No. 470,300. Class 8. Radio-telephonic instruments and parts thereof, &c.—Edison Bell, Ltd., 62, Glengall Road, Peckham, S.E.15.

Sedonia (lettering and design). No. 470,962. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—H. Seddons, trading as the Sheffield Wholesale Motor Supplies, 4, Charles Street, Sheffield.

Stransign (lettering and design). No. 471,447. Class 8. Electrically-illuminated signs.—Strand and Interchangeable Signs, Ltd., 24 and 28, Floral Street, W.C.2.

Loga-Cyclic. No. 471,998. Class 8. Apparatus for use in radio-telegraphy and telephony.—Portable Utilities Co., Ltd., 8, Fisher Street, Southampton Row, W.C.2.

Kalibond. No. 472,413. Class 8. Rubber-insulated electric cables.—Callender's Cable and Construction Co., Ltd.

Centroid. No. 472,514. Class 8. Apparatus for use in radio-telegraphy and telephony.—Camden Engineering Co., Ltd., Bayham Place, Camden Town, N.W.1.

Blic. No. 471,647. Class 13. Electric switches, terminals, couplings, cut-outs, sparking plugs and electric lamps.—British Lighting and Ignition Co., Ltd.

Published Specifications.

Compiled expressly for this journal by patent agents. The name of the applicant's patent agent, if any, will be found on the printed specification. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1925.

10,373. "Telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. April 21st, 1925. (258,306.)

11,422. "Thermostatic switches for controlling electric circuits." Austin Lighting Co., Ltd., and C. Bell-Walker. March 2nd, 1926. (258,308.)

12,972. "Thermionic amplifiers." S. B. Smith. May 18th, 1925. (258,315.)

15,386. "Variable electric condensers." W. J. Rickets. June 13th, 1925. (258,323.)

15,485. "Electric signalling systems." British Thomson-Houston Co., Ltd. June 20th, 1924. (235,875.)

15,521. "Vacuum tube coupling circuits for impulse-operated relays." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) (F. de Fremery). June 15th, 1925. (258,328.)

15,581. "Electric condensers." H. A. Miles. June 16th, 1925. (258,331.)

15,643. "Electric hot-plates." W. P. Belk. June 17th, 1925. (258,335.)

15,729. "Methods of impregnating fibrous insulation of stranded conductors." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) G. H. Nash and T. N. Riley. June 17th, 1925. (258,342.)

15,721. Cable supports." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). June 17th, 1925. (258,343.)

15,723. "Interconnecting arrangements between groups of switches in automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and C. R. Woodland. June 17th, 1925. (258,344.)

15,724. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. October 15th, 1924. (241,521.)

15,726. "Process for the manufacture of cables loaded with alloys of high magnetic permeability." W. S. Smith and H. J. Garnett. June 17th, 1925. (258,345.)

15,729. "Loud-speaking telephonic receivers." E. A. Graham (deceased). June 17th, 1925. (258,346.)

15,792. "Electric heating apparatus." Automatic Telephone Manufacturing Co., Ltd., and C. H. Archer. June 18th, 1925. (258,352.)

15,903. "Illuminated signs." G. T. Galley and E. W. Chamberlain. June 19th, 1925. (258,356.)

15,965. "Operating mechanism for electric condensers or other instruments." Wilkins & Wright, Ltd., and J. H. Hewitt. June 20th, 1925. (258,360.)

15,988. "Automatic and semi-automatic telephone systems." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.), and J. H. E. Baker. June 20th, 1925. (258,361.)

16,108. "Electric starting and lighting systems for motor vehicles and the like." E. C. R. Marks (Ford Motor Co.). June 22nd, 1925. (258,363.)

17,525. "Method of combining several electric conductors into a single composite conductor." Siemens-Schuckertwerke Ges. July 9th, 1924. (236,944.)

17,637. "Inductance coils." Igranic Electric Co., Ltd., W. K. Alford, and G. Holdway. July 9th, 1925. (258,381.)

17,724. "Multiplex parallel winding of dyna mo-electric machines." Forges and Ateliers de Constructions Electriques de Jeumont. July 22nd, 1924. (237,580.)

17,972. "Variable electric inductive coupling or like devices." F. K. Crowther and Radio Communication Co., Ltd. July 14th, 1925. (258,384.)

18,213. "Electrical condensers of variable capacity." Edison Swan Electric Co., Ltd., and L. H. Soundy. July 16th, 1925. (258,386.)

18,592. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. P. Young, J. Hutt, E. G. Parrott, and W. E. Gough. July 21st, 1925. (258,387.)

19,463. "Signal transmitting devices employing mechanical vibration filters." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Bell Telephone Laboratories, Inc.). July 31st, 1925. (Addition to 221,792.) (258,395.)

19,514. "Variable electrical condensers." W. J. Rickets. August 1st, 1925. (Addition to 258,323.) (258,396.)

21,222. "Variable electric condensers and the like." F. G. Warbrook. August 25th, 1925. (258,410.)

21,527. "Telephonic receivers." E. A. Graham (deceased). August 27th, 1925. (258,414.)

23,033. "Electric means for lighting gas burners." M. W. Larkin. February 19th, 1926. (258,422.)

25,607. "Tuned transformers." Radio Industries Corporation. November 28th, 1924. (243,685.)

27,911. "Mounting of insulator arms upon telegraph and telephone poles. P. C. Barton. November 6th, 1925. (258,441.)

28,439. "Electric discharge tubes." Siemens-Schuckertwerke Ges., and Dr. L. Szilard. November 12th, 1924. (242,997.)

30,442. "Electric signalling systems and apparatus." British Thomson-Houston Co., Ltd. December 4th, 1924. (244,036.)

32,347. "Electric motor control systems." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). December 22nd, 1925. (258,455.)

1926.

586. "Electrical cooking apparatus." Falkirk Iron Co., Ltd., H. J. Kennard, and A. R. Wood. January 8th, 1926. (258,463.)

616. "Electric switches." C. L. Arnold and M.K. Electric, Ltd. January 8th, 1926. (Addition to 249,339.) (258,464.)

1,415. "Electric safety lock." H. Bienert. January 18th, 1926. (258,467.)

3,135. "Electric signalling and/or controlling systems." Metropolitan-Vickers Electrical Co., Ltd. February 3rd, 1925. (247,193.)

3,150. "Process and apparatus for manufacturing metal-coated films or the like for electric condensers." Dubilier Condenser Co. (1925), Ltd. February 3rd, 1925. (247,196.)

3,569. "Non-resonant diaphragms for telephonic, microphonic, and like apparatus." E. Reisz. February 8th, 1926. (258,476.)

5,026. "Systems of electric power distribution and apparatus therefor." British Thomson-Houston Co., Ltd. February 21st, 1925. (248,001.)

5,413. "Lighting appliances." A. J. Stephens (T. W. Rolph and W. A. Dorey). February 25th, 1926. (258,482.)

9,737. "Loud speakers." Hopkins Corporation. January 5th, 1926. (258,502.)

10,164. "Electrically-heated steam generators or liquid heaters." International General Electric Co., Inc. April 18th, 1925. (250,970.)

10,303. "Rotors for dynamo-electric machines." Thyssen & Co., Akt.-Ges. May 25th, 1925. (252,335.)

10,259. "Vacuum electric discharge devices." Westinghouse Electric and Manufacturing Co. April 28th, 1925. (251,611.)

10,285. "Motor-vehicle head-lamps." M. H. Arbuckle and J. McKinney. April 19th, 1926. (258,508.)

10,956. "Electrical token apparatus for railways." A. T. Blackall and C. M. Jacobs. April 26th, 1926. (258,510.)

12,930. "Electric clocks." Y. Nojiri. May 20th, 1926. (258,519.)

17,045. "Electromagnetic vibratory devices." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Bell Telephone Laboratories, Inc.). July 25th, 1925. (Divided application on 18,973/25.) (258,530.)

17,234. "Electron-discharge devices." British Thomson-Houston Co., Ltd. July 20th, 1925. (Addition to 230,011.) (255,441.)

17,581. "Fittings for electric incandescent lamps provided with shades or reflectors." G. Campbell and E. Fowler. July 13th, 1925. (258,211.)

19,012. "Electromagnetic sound recording and reproducing machines." H. P. O'Reilly. June 17th, 1925. (Divided application on 258,021.) (258,535.)